



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



Library of the Museum  
OF  
COMPARATIVE ZOÖLOGY,  
AT HARVARD COLLEGE, CAMBRIDGE, MASS.

The gift of *F. W. Putnam*

No. 4464.

*Jan. 26, 1883 - Feb. 3, 1885 -*







Jan 26. 1883. 4464  
PUBLIC DOCUMENT.

SEVENTEENTH ANNUAL REPORT  
OF THE  
COMMISSIONERS  
ON  
INLAND FISHERIES  
FOR THE  
YEAR ENDING DECEMBER 31, 1882.

BOSTON:  
WRIGHT & POTTER PRINTING CO., STATE PRINTER  
18 POST OFFICE SQUARE.  
1883.





---

---

48-2  
570  
17

SEVENTEENTH ANNUAL REPORT

OF THE

COMMISSIONERS

ON

INLAND FISHERIES,

---

*With Compliments of*

*F. W. PUTNAM.*

---

BOSTON:  
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,  
18 POST OFFICE SQUARE.  
1883.





## CONTENTS.

---

	Page
REPORT, . . . . .	5
APPENDIX A. List of Commissioners on Fisheries, . . . . .	25
B. List of Ponds leased, . . . . .	31
C. Legislation, . . . . .	36
D. Returns of Weirs, Seines, and Gill-nets, . . . . .	40



# Commonwealth of Massachusetts.

---

*To His Excellency the Governor and the Honorable Council.*

The Commissioners on Inland Fisheries beg leave to present their Seventeenth Annual Report.

## FISHWAYS.

Fishways have been completed this season at Ipswich Mills, at Willowdale, and at the dam of C. J. Norwood. Ripley Bros. failed to comply with the requirements. Some arrangement will be made for putting in a fishway over this dam early in the spring, and this will open the Ipswich River its whole length.

The mill and dam at Middleborough having passed into the hands of Mr. Sherman, a fishway will be constructed at that place next year. Negotiations are pending for the construction of one at Swansea. The fishways throughout the State are generally in good working order, and answer the purpose for which they were constructed.

The following is the report of Mr. Holmes, Superintendent of Lawrence Fishway :

### REPORT OF FISH SEEN, IN THE LAWRENCE FISHWAY IN THE YEAR 1882.

April 22. Let water into fishway.

- May
5. Saw the first fish ; a few alewives, suckers and chubs.
  6. Alewives and suckers, run small.
  7. Alewives, run small ; suckers and chubs, run large.
  8. Alewives, suckers and chubs, run small.
  9. Alewives, suckers and chubs, run small.
  10. Alewives and lampers (" lamper eels "), run small ; suckers, run large.
  11. Alewives, suckers and lampers, run small.
  12. Alewives, suckers, chubs and lampers, run small.
  13. Alewives, suckers and chubs, run small.

- May 14. Alewives, suckers and lampers, run small.  
 15-27. The river high, muddy, and a very cold rain; very few fish running.  
 29. Alewives, run moderate; lampers, run small.  
 30 to } A big freshet in the river; water very muddy; very few fish  
 June 7. } running.
8. Alewives, suckers and lampers, run moderate.
  9. Alewives, suckers and lampers, run moderate.
  10. Alewives, run large; lampers, run small.
  11. Alewives, suckers and lampers, run moderate; one silver eel; a few red-fin shiners.
  12. One *shad*; alewives and suckers, run large; lampers, run small.
  13. Alewives and suckers, run large; lampers, run moderate; one silver eel; two black bass.
  14. Alewives, suckers and lampers, run large; one silver eel; one black bass; a few red-fin shiners.
  15. Alewives and suckers, run large; lampers, run small.
  16. Alewives, run large; lampers, run small; one black bass; *one salmon*, 15 pounds.
  17. Alewives and suckers, run moderate; lampers, run small; a few small silver eels.
  18. Alewives and suckers, run moderate; lampers, run small.
  19. Alewives and suckers, run small.
  20. Alewives and suckers, run small; one black bass; *one salmon*, 10 pounds.
  21. Suckers, run small; *one salmon*, 10 pounds; river high.
  22. Alewives and suckers, run moderate; lampers, run small; one silver eel.
  23. Alewives and suckers, run moderate; one black bass.
  24. Alewives and suckers, run small; one *shad*.
  25. Suckers, lampers and silver eels, run small.
  26. Suckers and silver eels, run small; *four salmon*, 10 to 15 pounds.
  27. *Four salmon*, 10 to 15 pounds.
  28. Suckers and silver eels, run very small; one black bass.
  29. Suckers and silver eels, run small.
  30. One black bass; *two salmon*, 8 to 12 pounds; suckers and silver eels, run small.
- July 1. Suckers, chubs and silver eels, run small.  
 2. Suckers, chubs and silver eels, run small; one black bass.  
 3. Suckers, chubs and lampers, run small.  
 4. Suckers, chubs and small silver eels, run small.  
 5. Suckers, chubs and silver eels, run small.  
 6. Suckers and chubs, run small; one black bass.  
 7. Suckers, chubs and silver eels, run small.  
 8. Suckers, chubs and silver eels, run small.  
 9. Suckers, chubs and silver eels, run small; a few small roach; one black bass; *one salmon*, 12 pounds.

- July 10. Suckers, chubs and silver eels, run small; *two salmon*.  
 11. Suckers, chubs and silver eels, run small; *three salmon*.  
 12. Suckers, chubs and roach, run small; four black bass.  
 13. Suckers, chubs silver eels, and roach, run small.  
 14. Suckers, chubs and silver eels, run small; two black bass.  
 15. Suckers, chubs and silver eels, run small.  
 15. Suckers, chubs and silver eels, run small; three black bass.  
 17. Suckers, chubs and silver eels, run small.  
 18. Suckers, chubs and silver eels, run small.  
 19. Suckers, chubs and silver eels, run small; two black bass.  
 20. Suckers, chubs and silver eels, run small.  
 21. Suckers, chubs and silver eels, run small.  
 22. Suckers, chubs and silver eels, run small; three black bass.  
 23. Suckers, chubs and silver eels, run small; four black bass.  
 24. Suckers, chubs and silver eels, run small.  
 25. Suckers, chubs and silver eels, run small.  
 26. Suckers, chubs and silver eels, run small; two black bass.  
 27. Suckers, chubs and silver eels, run small. Shut water out of fishway; river very low.

Water shut out of the fishway the rest of July and August, excepting Sundays, on account of low water. When water was shut out of fishway only a few suckers, chubs and silver eels in it. Water shut out in September, excepting Sundays, until the 16th, when it was let in in the afternoon.

- Sept. 17. Suckers and chubs, run small; *one salmon*, 8 pounds.  
 18. *Three salmon*, 8 to 15 pounds.  
 19. Suckers, chubs and silver eels, run small.  
 20. Suckers and silver eels, run small. Shut water out of fishway; river low.  
 23. Let water into fishway at night.  
 24. Suckers and chubs, run small; *one salmon*, 10 pounds.  
 From September 25 to September 28 a freshet in the river; water very turbid; did not draw the fishway off.  
 29. A few suckers and chubs; *one salmon*, 10 pounds.  
 30. A few suckers and silver eels.

From October 1 to November 1 saw nothing but suckers, chubs and silver eels in fishway. The run of suckers and chubs was quite large for about two weeks, then it was less and less, until I shut the water out (November 1), when there was no fish.

THOS. S. HOLMES,

*Superintendent Lawrence Fishway.*



## LAND-LOCKED SALMON.

Massachusetts' share of land-locked salmon spawn for 1882 was 107,500; to this were added 5,000 given by the U. S. Commission. They were hatched with a loss of 4,300 eggs, giving something over 108,000 healthy young fish, which were distributed as follows:—

	CANS.
E. B. Owen, for ponds in Stockbridge, . . . . .	4
E. B. Stoddard, for ponds in Worcester, . . . . .	4
Thos. Lawrence, for ponds in Falmouth, . . . . .	2
A. Phinney, for ponds in Falmouth, . . . . .	4
A. J. Hubbell, for ponds in Gt. Barrington, . . . . .	4
Sydney Strong, for ponds in Northampton, . . . . .	4
W. A. Bullard, for ponds in Wayland, . . . . .	2
J. H. Curtis, for ponds in Scituate, . . . . .	2
W. H. Savage, for ponds in Harvard, . . . . .	3
J. F. Wight, for ponds in —, . . . . .	1

There was scarcely any loss in transportation. Some complaints have been expressed in regard to the distribution of land-locked salmon and trout from the fact that the demand was greater than the supply. This will probably be, at least in part, obviated by an increased supply of these fish for distribution for the spring of 1883.

Parties desiring young fish will lessen the labors of the Commissioners by sending early applications.

TROUT. (*Salmo fontinalis*).

There were hatched from last year's spawn about 47,000 brook trout, which were distributed as follows:—

	CANS.
C. W. Forbes, Sheffield, . . . . .	1
W. H. Foote, Westfield, . . . . .	4
Gordon C. Rowley, Blandford, } . . . . .	
E. M. Sewell, Medfield, . . . . .	1
J. F. Wight, Boston, . . . . .	1
Henry Goulding, Natick, . . . . .	1
W. Hapgood, Boston, . . . . .	2
O. C. White, Hopkinton, . . . . .	1
John Cummings, Woburn, . . . . .	2
Thos. Talbot, North Billerica, . . . . .	2

It will be seen by Superintendent Hodge's report that there will probably be an increase of brook trout for next spring, and that extensive preparations have been made for a large supply in the future, not only of these fish, but also of the California or rainbow trout, a remarkably hardy fish, suited to warmer water than the common brook trout, and growing much more rapidly. It is said that the introduction of the California trout has succeeded well in New York State.

In addition to these there will be, for distribution next April or May, from eighty to ninety thousand Lake Superior or salmon trout. These should be placed in the largest and deepest ponds in the State. They are not suited for streams and shallow water.

#### HATCHING SHAD ON THE MERRIMACK.

In the report of last year it was stated that by hatching shad at North Andover, and carrying the young fish well up the river, the breeding-grounds might be extended, giving a large increase in addition to the artificial propagation. The statement in regard to the increase of the breeding-grounds is based upon the fact, that, of the few shad known to have reached the Lawrence dam since the new fishway was constructed, some, and probably all, have gone freely over it. That there is no impediment to the easy passage of all kinds of fish over this dam, is well known to all who have paid the subject any attention.

In accordance with this statement, arrangements were made for restocking the river; but, owing to unexpected delays, the work was not commenced till the spawning season was partially over. This greatly lessened the amount of spawn which otherwise might have been secured. The taking and hatching of spawn was carried on at North Andover, the only place on the river where ripe shad can be obtained. The work was done by Holmes and Chadwick, under the immediate inspection of the Commission. Owing to the unavoidable delay, the scarcity of fish, and a sudden rise of temperature of the river, the number of young shad obtained fell short of what was expected.

## DETAILED REPORT OF HOLMES AND CHADWICK.

*To the Commissioners on Inland Fisheries.*

GENTLEMEN: — We herewith submit the following report, giving the full details of this year's experience in hatching shad at North Andover. The hatchery was opened June 12th, and closed July 20th.

Number of shad taken, . . . . .	654
“ shad sold, . . . . .	55
“ shad returned to river alive, . . . . .	268
“ shad given away, . . . . .	331
“ males, . . . . .	334
“ females, . . . . .	320
“ striped bass taken, . . . . .	2
“ salmon taken, . . . . .	29
“ “ returned to river alive, . . . . .	26
“ “ taken dead, . . . . .	3

The estimated amount of shad spawn taken was 1,227,000. From this amount about 1,000,000 fish were hatched. Of this number, 150,000 were delivered to the Fish Commissioners of New Hampshire, to be turned into the river above Concord, N. H.; 40,000 were turned into the river four miles above the Lawrence dam. The balance, nearly 800,000, were turned into the river at the hatching station at North Andover. A large portion of the 331 shad given away were distributed to laboring men with families, mostly mill operatives.

It is evident that the largest percentage of the spawn may be expected to hatch when the temperature of the water is from 70° to 74°. When the temperature of the water rose to 76°, it was found necessary to cover the hatching-boxes with cloth to protect the spawn from the direct rays of the sun. Thus protected there is but little difficulty in hatching the spawn until the temperature of the water rises above 80°. The following table will show the number of shad taken each day, the proportion of males to females, the temperature of the water and air, also the time of drawing the seine, the number of fish taken at each sweep, and the estimated amount of spawn taken.

		Shad taken.	Males.	Females.	Temperature of Water at 7 p.m.	Temperature of Air at 7 p.m.	Time of hauling seine.	Fish per sweep.	Estimated amount of spawn taken.
June	12, .	28	20	8	65°	62°	7, 8, p.m.	11, 17	18,000
"	13, .	15	10	5	66	60	7, 8, 9, "	8, 7	12,000
"	14, .	36	22	14	68	65	7, 8, 9, "	9, 13, 14	10,000
"	15, .	11	7	4	70	64	7, 8, 9, "	3, 4, 4	18,000
"	16, .	37	24	13	71	67	7, 8, 9, "	21, 9, 7	20,000
"	17, .	25	15	10	69	65	6, 7, 8, 9, "	11, 3, 11	30,000
"	19, .	26	14	12	71	65	6, 7, 8, 9, "	8, 10, 8	30,000
"	20, .	36	22	14	72	61	6, 7, 8, 9, "	8, 12, 16	40,000
"	21, .	23	12	11	70	62	7, 8, 9, "	4, 10, 9	55,000
"	22, .	24	13	11	70	66	2, 3, 6, 7, 8, "	2, 6, 9, 4, 3	,000
"	23, .	10	5	5	70	68	7, 8, 9, "	1, 6, 3	4,000
"	24, .	15	6	9	73	76	7, 8, 9, 11, "	1, 10, 4	60,000
"	26, .	44	19	25	74	68	7, 8, 10, "	4, 24, 16	200,000
"	27, .	35	14	21	74	63	7, 8, 9, "	9, 26	200,000
"	28, .	26	10	16	77	68	7, 8, 9, "	7, 10, 9	50,000
"	29, .	28	12	16	76	63	7, 8, 9, "	6, 10, 12	60,000
"	30, .	32	9	13	75	62	7, 8, 9, "	8, 4, 10	30,000
July	1, .	20	9	11	72	59	7, 8, 9, p.m.	3, 6, 11	30,000
"	3, .	21	14	7	70	62	6, 7, 9, "	6, 8, 7	12,000
"	5, .	9	5	4	68	59	7, 8, 9, "	0, 3, 6	12,000
"	6, .	17	10	7	68	62	7, 8, 9, "	6, 4, 7	,000
"	7, .	32	17	15	69	63	7, 8, 9, "	4, 20, 8	80,000
"	8, .	21	10	11	72	68	8, 9, 10, "	6, 8, 7	30,000
"	10, .	19	6	13	76	74	7, 8, 9, "	8, 4, 7	20,000
"	11, .	14	5	9	79	76	8, 9, "	6, 8	50,000
"	12, .	13	5	8	79	74	7, 8, 9, "	0, 6, 7	20,000
"	13, .	15	6	9	79	74	7, 9, "	8, 12, 3	80,000
"	14, .	12	4	8	79	73	8, 9, 10, "	8, 1, 3	30,000
"	15, .	6	2	4	80	72	7, 8, 9, "	3, 0, 3	8,000
"	17, .	7	3	4	80	71	7, 8, 10, "	1, 2, 4	18,000
"	18, .	4	3	1	80	70	7, 8, 9, "	3, 0, 1	,000
"	19, .	3	1	2	80	73	8, 9, "	2, 1	,000

The results of the artificial hatching of shad this season have been very encouraging, but a much greater number of fish should be annually hatched at this station in order to increase the run of fish in years to come. This station when put in good running order will produce 3,000,000 shad in the period of forty days from the first day of June. To persons not acquainted with fish-culture this may seem to be a large number; and yet it is small, comparatively, when we consider that previous to the obstructions to migratory fish, made by the construction of numerous dams on the river, the annual deposit of shad spawn along the headwaters of the Merrimack was probably more than twenty millions. Should the business be continued another season, it will be economy for the State to own a new seine made expressly for this station. The mesh should be two and a half inches, thus avoiding the killing of fish in hauling. A simple log boom is not sufficient to properly protect the hatching-boxes from the large amount of filth floating in the river. A movable boom, thirty feet long and ten inches deep, made of planks at a proper angle, sloping in both directions and safely anchored with chains, could be constructed at an expense not exceeding ten dollars, and this would greatly lessen

the amount of labor in the care of the hatching-boxes. Better accommodations are also needed for the fishermen.

Yours respectfully,

B. P. CHADWICK,  
ROBERT R. HOLMES.

From information obtained from time to time it appeared evident that the depletion of the Merrimack River was largely due to other causes than the legitimate fishing. It was decided that a thorough investigation should be made. For this purpose Mr. B. P. Chadwick was appointed. He was indorsed by the Chief of the State Detective Force as a suitable man for the purpose. His report was severely criticised by the Newburyport fishermen. The Commissioners, however, believe that Mr. Chadwick was loyal to the State, and that he faithfully discharged the duties assigned him. Finding that his report had created a strong opposition, Mr. Chadwick tendered his resignation. On the recommendation of several of the leading citizens of Newburyport, Edwin F. Hunt was selected to make further investigations at the mouth of the river. Mr. Hunt is a citizen of Newburyport, has been a fisherman, and is familiar with the fisheries of the Merrimack. The report of Mr. Hunt, which is here appended, is more conservative than that of Mr. Chadwick, yet in regard to the important question of the destruction of the young fish, it does not materially differ, and is corroborated by statements which have been received during the past three years.

#### REPORT OF THE FISHERIES ON THE LOWER MERRIMACK.

##### *To the Commissioners on Inland Fisheries.*

GENTLEMEN, — I beg leave to present the following report for the year ending Nov. 3d, 1882.

There have been eight (8) seines used more or less on the lower part of the Merrimack during the past season, as follows, — five (5) at Newburyport, one (1) at Amesbury, one (1) at Groveland, and one (1) at Haverhill. Those at Newburyport are owned and run more or less as follows: Hiram Janvrin, Benjamin Stevens, Lewis Atwood, Samuel Furlong, George Thurlow and Henry Short. The seine of Nicholas Lattimer, with Andrew Hall as assistant, has been used occasionally.



Mr. Lattimer uses his small seine for catching bait for his eel-pots, also for smelts and yellow eels that will not be induced to enter the black-eel pots. Besides the above-named fishermen, the following persons usually engaged in clamming, use seines occasionally,—Daniel Nutting, John Hoyt, John Bryant, Charles Ryan, Lewis Short, Joseph Furlong, John Black, Clinton Lattimer, D. Coullard, Augustus Pike, Eliphalet Pike, Henry Sayward. The three seines used by these were owned by William Perkins, John Janvrin and Eliphalet Pike. Mr. Pike, the last named owner, after being duly warned not to break the law, persisted in fishing during the closed season in June, and, in consequence, he was proceeded against, fined by the court twenty-five dollars (\$25) with costs of court, and confiscation of nets and boats.

For the second season no menhaden have appeared at the mouth of the river. As a consequence the fishermen have depended upon alewives, bluebacks, and such other small fish as could be caught for bait. Many vessels in search of bait, which would have entered the river had the menhaden been plenty, were obliged to go elsewhere.

The number of shad taken during the allowed time of fishing in May was small, the season being unusually late. June 23d a considerable number of shad were taken, but mostly returned to the river, according to law. July 6th the first outside vessels came for bait. There were during the season, furnished to vessels engaged in fishing, about seventeen hundred barrels of bait at \$1.25 per barrel.

For several seasons past there have been some parties here from New York State fishing for sturgeon. They arrived this year July 11th, and stopped about four weeks, catching only three sturgeon. So far as I have been able to learn no other persons have fished for sturgeon on the river. Soon after the burning of the Pacific Mills at Lawrence, when a large amount of dyestuffs and other chemicals flowed into the river, report came to me that a large number of dead salmon were to be found on the shores of the river. I made a careful inspection of both banks, and found one dead salmon below Essex Merrimack bridge, and six between Lawrence and Haverhill. I am confident that this is the extent of the injury done to the fish, although reports multiplied them into hundreds.

There was considerable unpleasant feeling manifested toward me in discharging my duty, which was entirely unnecessary and uncalled for. If the fishermen intended to abide by the law which they themselves agreed to, there would have been no occasion for complaint or ill-feeling on their part. On the whole I think they have done better than was expected. I have been a fisherman myself and know something of the temptation that surrounds them. Again, it is not easy to break old habits. Many of them do not stop to reflect upon the result of what they are doing, and think it hard that they should not be allowed to do just what they please without any interference.

Your attention has been called to the fact that seines with meshes of one-quarter to one half-inch are used in the fall when the young shad and alewives descend the river. I forward to you a sample of young

fish taken from one of these seines, for inspection. It is very evident that the use of these seines is a serious injury to the fisheries of the Merrimack, and in justice to all should be discontinued.

Yours truly,

EDWIN F. HUNT.

It is desirable that hatching and planting of shad should be prosecuted vigorously, and that every obstacle in the way of restocking the river should be removed. The attention of the legislature is called to the fact that there are several seines used at Newburyport with a mesh of from a quarter to half an inch. These nets are run through the fall months, at the time the young shad and alewives are descending the river, and are used for the purpose of taking all kinds of small fish. This is not only unjust to all the fishermen, but cannot fail to be a serious drawback in restocking the river, or even in maintaining it in its present condition. We recommend that no seine be allowed on the lower part of the Merrimack with a mesh less than two and one-half inches, or what is known as the alewife mesh. This would in no way interfere with the taking of menhaden and alewives, or what the fishermen call bluebacks, for bait, while it would prevent the wholesale destruction of young fish.

#### SALMON (*Salmo salar*).

In the spring of 1871 your Commissioners, united with several of the New England States for the purpose of procuring salmon spawn, under the superintendence of Charles G. Atkins, Commissioner of Maine. His plan was to buy live salmon from the fishermen at the mouth of the Penobscot River, and transport them to a small pond where they would be under control until ready to spawn. By this arrangement the cost of salmon spawn was reduced from forty (40) dollars per thousand, the price charged in Canada, to less than three (3) dollars. Soon after the commencement of this work Prof. Baird, United States Commissioner, joined the association, tendering the aid of the National Government. This arrangement continued until 1876, when Prof. Baird, under the impression that salmon spawn could be obtained from California at much less expense, withdrew from the Bucksport establishment.

As the funds of the New England Commissioners did not warrant the continuation of the work alone, it was for a time abandoned. Prof. Baird's conclusion as to the cost of California spawn was correct; but unfortunately the California salmon (*Salmo quinnat*), after a fair trial, proved to be an entire failure in New England waters. This was a disappointment, causing a break of four years in the work of establishing salmon in the Merrimack, as well as elsewhere. The success of the Penobscot salmon in the Merrimack has led to the re-opening of the works near Bucksport, with the co-operation of the United States Commission. By means of the contributions from several of the New England States, together with the assistance of the National Government during the past three years, the hatching works near Bucksport have been sending out a large supply of excellent salmon spawn. As it takes four years from the time they are hatched for salmon to return as spawning fish, the break above alluded to was more or less felt during the past season; but, notwithstanding this, more salmon have been taken this year at the Plymouth Works than at any season since they commenced returning to the river. During the last two years about eight hundred thousand young fish have been turned into the Pemigewasset River above Livermore Falls. The consequence is that the river has swarmed with smolts, or young fish, during the past season. The return of these fish in 1885 and 1886 ought to furnish the works at Plymouth with a large amount of salmon spawn. This would obviate the necessity of going elsewhere for a supply.

Thirty-six thousand young salmon were turned into the Nashua River.

*Salmon Spawn hatched, and Young Fish put into the Headwaters of the Merrimack in 1882.*

Spawn from Bucksport, . . . . .	341,000
Loss of eggs and fish, . . . . .	6,698
Put into the river, . . . . .	334,302
Salmon spawn taken at Plymouth, N.H., . . . . .	125,000
Loss of eggs and fish, . . . . .	4,319
Total number of young salmon turned into the river for the spring of 1882 . . . . .	454,983

REPORT OF E. B. HODGE, SUPERINTENDENT OF THE WORKS AT PLYMOUTH, N.H., UNDER THE JOINT ACTION OF MASSACHUSETTS AND NEW HAMPSHIRE.

*To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts.*

When I assumed charge of the joint hatching-house near Livermore Falls, June 1, the work of hatching for the year had been completed, and the salmon fry had been placed in the Pemigewasset. I immediately had the reservoir put in condition to receive the expected spring run of salmon.

The nets were placed in the river the 20th of June, and the first salmon taken the 26th. Owing to another unusually dry season following the severe drought of last year, the water, by the 20th of July, became too low for the fish to run. The fall run began about the last of September, and the last salmon was taken November 3. Thirty-three were taken in all — an increase of about twenty-five per cent.

The eggs were taken the last week in October, and are remarkably healthy, the loss so far being only a fraction of one per cent.; 150,000 brook-trout eggs are now in the hatching-house, 75,000 of which I shall forward to you as soon as they are sufficiently advanced.

The unusual low water in the Pemigewasset the last two years is not owing, as many suppose, to cutting away of the forests, causing the springs to dry up, and thus diminishing the volume of water in the river, but to the unusual light rain-fall, — as the area of woodland in Grafton County, and I might say in the whole State, is larger than twenty-five years ago. As directed, I have added about 500 brook-trout this season to the stock already in the ponds, making now about 600 two years old and upwards, and 500 from one to two years old.

There are also in the large pond from two to four thousand fry of the "California" or rainbow trout. Many of them are four inches and over in length, which shows a rapid growth, as they are only six months old. It will be necessary to prepare a place for them another season.

The young salmon in the river this year were unusually plenty, more so than any previous year. So numerous were they on the rapids below the falls that it was impracticable to fish for trout, as a parr or smolt would be hooked at almost every cast.

Many of the salmon that passed the fishways did not reach here, owing to the low water. They were plenty between here and Bristol in the pools, and some are reported to have fallen victims to the spear of the poacher.

It is to be hoped that some action will be taken the coming season to prevent such violation of the law.

Over 900 feet of gravelled walk has been made around the ponds. As the supply of water in the hatching-house was not sufficient for the young fish when all the trays were full, I have laid a two-inch pipe from the large spring south of the house, which gives an additional supply of over 16,000 gallons per day. This water is three degrees colder than that from the old spring, and will retard the hatching, which

will be an advantage, as the young fish will not be ready to place in the streams until they are free from ice and have become warm enough to furnish food for the young fry.

The fact that no increase in the run of salmon was expected this year, together with the unusually large number of young fish in the river, certainly gives great encouragement for the success of the enterprise in the future.

E. B. HODGE, *Superintendent*.

PLYMOUTH, N. H., Dec. 4, 1882.

### CULTIVATION OF CARP.

In the fall of 1880 the Massachusetts Commissioners sent to Washington and procured from Prof. Baird five hundred German carp. Soon after eight hundred more were received from Prof. Baird, together with a list of about forty applicants from various parts of New England. These fish were distributed as stated in the report of 1880. The carp were very small, being only two or three inches long, and the number distributed not exceeding a dozen to each person. In all cases the applicants were informed that the carp were vegetable feeders, and utterly defenceless against other fish, and that frogs and water-snakes were very destructive to them. But little attention appears to have been paid to these statements. In many cases the young carp were dumped into ponds containing perch, pickerel, and other voracious fish, or into sloughs among pouts, frogs and mud-turtles, where no protection could be given them. Under such circumstances it is not to be wondered at that but little has been heard from them, and that most of the parties took their last look at them when they turned them into the water, or that the impression has gone out that they are not suited to the waters of New England. This impression has been strengthened by statements of the success and wonderful growth of the carp in the Southern States.

Under the treatment they received it was a mistake to have distributed them in such small numbers. Had each applicant received one or two hundred the result might have been more satisfactory.

The carp is essentially a farmer's fish, easily raised, and requiring no great amount of skill to obtain them in abundance. In some places in Austria and Bohemia the

land is alternately used for raising crops and carp; first the land for a few years is used for agricultural purposes, then flowed and stocked with carp.

Four of the five hundred carp received by the Commissioners were placed in the reservoir at the Tewksbury Almshouse. There were several reasons for putting them in that place. First, they were received too late in the season to prepare a pond for them; secondly, it gave a chance of testing them without expense to the State. The water is cold spring-water, pumped from what used to be a trout stream. They have lived and grown finely, many of them weighing from one and a half to two and a half pounds. The bottom of the reservoir is paved with stones. This, with the low temperature of the water, prevents vegetable growth, and consequently renders it an unfavorable place for carp. With a grassy bottom and higher temperature they would probably have doubled their size. This shows a rapid growth under adverse circumstances. They have been under the care of Mr. T. J. Marsh, Jr., assistant superintendent, who has fed them with stale bread from the almshouse. Many of the fish are large enough to spawn next summer. Should the appropriation warrant it, breeding ponds will be constructed in the spring, and every effort made to multiply and distribute them in large numbers. Applications are on file from almost every town in the State, asking for a supply of these fish. They are especially valuable to the inland towns where fish are scarce, and where they can be grown for a less price than any other food.

Carp ponds should be flowed loam or grass land, the deepest part running through the centre, sloping to the outlet, where it need not be over five or six feet deep. The rest of the pond should be shallow. This would enable the cultivator to control the water, and by drawing it off slowly bring all his fish into a small compass. Very little more water is needed than will supply the evaporation. When streams are dammed for the purpose of making ponds, the overflow may be taken around the pond and the supply from an inlet at the upper end or side. The fish may be fed on all kinds of vegetables. Where the pond is large they will obtain a large part of their food from the pond. It is a

question of pasturage and feed as to the number kept in a pond of a given size. As their food is inexpensive, being easily obtained on any farm, the keeping of large numbers in a small place may be often desirable. Water-snakes, frogs, and every kind of fish that preys upon other fish should be kept out of the breeding pond, or any other place where the young carp are kept. According to the statement of R. O. Sweeney, Commissioner of Minnesota, the carp have thriven in the ponds connected with the hatchery of that State.

Mr. Sweeney says that he received 300 carp some time ago from Prof. Baird, but upon his advice had kept them in the hatchery for breeding purposes. There they had grown well and had bred well, but the Commissioners did not know to what extent, as they did not wish to disturb them in the pond, and to find out just what the result would necessitate the drawing off of the pond or the use of nets, as the fish would not bite. He believes that within a short time there will be plenty of carp at the hatchery to distribute throughout the State.

#### CONCLUSION.

In the economy of living, next to meat comes fish, the importance of which has been recognized through all time, for in addition to its nutritious character it enables us to vary our food, an essential to good health, and, until within a few years, has had the additional merit of being the cheapest of food, coming within the reach of the humblest laborer.

Had this state of things continued it is possible that but little would have been done in fish-culture. The increase in population, together with the facilities for rapid transportation, have increased the demand beyond the supply, and prices have advanced until fresh fish, before it reaches the consumer, costs more than bread.

The possibility of fish becoming one of the *luxuries* instead of one of the *necessaries* of life has created a public sentiment throughout the civilized world, demanding that fish-culture should receive its full share of attention. It was *this* that forced the National Government to create a Commission to investigate and improve the fisheries, and caused *thirty-five* States and Territories to appoint Commis-

sioners, backed in many cases by large sums of money, for the purpose of devising the best means of restocking our rivers and streams to their former abundance.

Considering the short time which has elapsed since the commencement of the work, and that many if not all of the Commissioners had, at times, to grope their way in the dark, the results obtained are remarkable.

Massachusetts was the first to lead in this work, with, probably, more obstacles to overcome than any other State. Her migratory fish had all been destroyed or so reduced as to be of little value; a result which many persons supposed was not so much due to overfishing as to blocking the rivers and streams by insurmountable dams, preventing the return of the fish to their spawning grounds.

The vast wealth invested in the manufactories, the motive power of which was derived from these dams, was naturally arrayed against any efforts to restock the rivers. It was therefore no inconsiderable part of the work of the Commissioners, to harmonize as far as possible the public rights in the fisheries and the private interests of the manufacturers.

The invention of the fishway now in use in this State, as well as in some others, taking, as it does, so little water and that at a time when there is generally a surplus, did much toward removing any misapprehensions of the owners or occupants of the dams, and it is due them to say that, with very few exceptions, they have willingly complied with the demands made upon them.

Successful as has been the work of the Commissioners throughout the several States, little has been done compared with what might have been, and doubtless *will be*, when the people more thoroughly see its importance and acquire the judgment and skill necessary to complete success. Fish-culture, like every other industry, is a matter of growth. It has taken many years to bring our manufactories up to their present standard. No public enterprise can be forced much above the general intelligence of the community, and fish-culture is no exception to the rule. So long as a State allows the destruction of the young fish distributed for the purpose of restocking its waters, or a few rapacious fishermen are



permitted to overrule the public good, so long will the work be more or less retarded.

With our one hundred and ninety-six thousand three hundred and forty acres of land covered with water, it will be seen that few States possess the advantages of Massachusetts for fish-culture.

This large area of water does not include the small streams that everywhere thread our meadows and lowlands, which might be turned into carp ponds, yielding a far better return than any other part of the farm.

The Hon. Theodore Lyman, who has faithfully served as a Commissioner without compensation since the establishment of the Commission, over seventeen years ago, has retired from the board during the present year. His colleagues on the Commission desire to place upon record their high appreciation of his labors in the cause of fish-culture, and their recognition of the cordial relations which have always existed between them. For what has been accomplished in restocking our ponds and rivers, and in arousing public interest in the work, the Commonwealth is largely indebted to him; while his influence has always been given to secure the rights of the people.

Respectfully submitted,

E. A. BRACKETT,  
ASA FRENCH,  
F. W. PUTNAM,

*Commissioners.*

## EXPENSES OF COMMISSION.

---

Salary, . . . . .	\$1,650 00
Travelling and other expenses, . . . . .	132 60
Paid to Priscilla Freeman (Res. 1882, Chap. 55), . . . . .	500 00
Subscription to fund of Schoodic Salmon-breeding Establishment, . . . . .	500 00
Subscription to fund of Penobscot Salmon-breeding Establishment, . . . . .	500 00

## GENERAL EXPENSES.

*Hatching-house at Plymouth:—*

A. H. Powers, services, . . . . .	\$150 00	
Rent of hatching-house, . . . . .	25 00	
Rent of land and streams, . . . . .	25 00	
Labor, . . . . .	31 25	
Expressage, . . . . .	28 36	
Miscellaneous expenses, . . . . .	24 53	
		\$284 14
Rent of land for hatching-house at Winchester, . . . . .	50 00	
George E. Atkinson, care of Holyoke Fishway, . . . . .	75 00	
Edwin F. Hunt, services and expenses, . . . . .	524 27	
E. B. Hodge, services and expenses, . . . . .	227 56	
Essex Company, privilege of fishing in Merrimack River, . . . . .	30 00	
Morris Knowles, labor and materials at Lawrence, . . . . .	82 90	
Chase Philbrick, services, Merrimack River, . . . . .	49 50	
James Smith, services, Merrimack River, . . . . .	10 00	
John A. Loring, use of premises, boats and nets at Andover, . . . . .	50 00	
Thos. H. Pinkham, services of assistant, . . . . .	51 00	
F. D. Brackett, services and expenses, . . . . .	24 10	
W. H. Foote, expenses, . . . . .	3 05	
Printing, . . . . .	168 26	
Postage, telegrams and expressage, . . . . .	30 58	
Cases and boxes, . . . . .	10 70	
Rubber boots, . . . . .	4 50	
Fish screens, . . . . .	20 10	
Gate and lock at Holyoke Fishway, . . . . .	4 85	
		<hr/> \$1,983 11

---

---

## APPENDIX.

---

---



[A.]

LIST OF FISH COMMISSIONERS.

---

DOMINION OF CANADA.

W. F. Whitcher, Commissioner, . . . . . Ottawa, Ontario.

PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, . . . . . St. John.

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, . . . . . Amherst.

PROVINCE OF PRINCE EDWARD ISLAND.

J. H. Duvar, Inspector, . . . . . Alberton.

PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson, . . . . . Victoria.

THE UNITED STATES.

Prof. Spencer F. Baird, . . . . . Washington, D.C.

ALABAMA.

C. S. G. Doster, . . . . . Prattville.

D. B. Huntley, . . . . . Courtland.

ARIZONA.

John J. Gosper, . . . . . Prescott.

Richard Rule, . . . . . Tombstone.

Dr. J. H. Taggart, Business Manager, . . . . . Yuma.

ARKANSAS.

John E. Reardon, . . . . . Little Rock.

James H. Hornibrook, . . . . . Little Rock.

H. H. Rottaken, . . . . . Little Rock.

## CALIFORNIA.

S. R. Throckmorton, . . . . .	San Francisco.
J. D. Farwell, . . . . .	Niles, Alameda Co.
W. W. Traylor, . . . . .	San Francisco.

## COLORADO.

Wilson E. Sisty, . . . . .	Idaho Springs.
----------------------------	----------------

## CONNECTICUT.

Dr. Wm. M. Hudson, . . . . .	Hartford.
Robert G. Pike, . . . . .	Middletown.
George N. Woodruff, . . . . .	Sherman.

## DELAWARE.

Enoch Moore, Jr., . . . . .	Wilmington.
-----------------------------	-------------

## GEORGIA.

J. T. Henderson, Commissioner of Agriculture, and <i>ex officio</i> Commissioner of Fish and Fisheries, . . . . .	Atlanta.
Dr. H. H. Cary, Supt., . . . . .	La Grange.

## ILLINOIS.

N. K. Fairbank, President, . . . . .	Chicago.
S. P. Bartlett, . . . . .	Quincy.
S. P. McDoel, . . . . .	Aurora.

## INDIANA.

Calvin Fletcher, . . . . .	Spencer, Owen County.
----------------------------	-----------------------

## IOWA.

B. F. Shaw, . . . . .	Anamosa.
A. A. Mosher, Assistant, . . . . .	Spirit Lake.

## KANSAS.

Hon. D. B. Long, . . . . .	Ellsworth.
----------------------------	------------

## KENTUCKY.

William Griffith, President, . . . . .	Louisville.
Hon. John A. Steele, . . . . .	Versailles.
Dr. Wm. Van Antwerp, . . . . .	Mount Sterling.
A. H. Goble, . . . . .	Catlettsburg.
Hon. C. J. Walton, . . . . .	Munfordville.
Dr. S. W. Coombs, . . . . .	Bowling Green.
John B. Walker, . . . . .	Madisonville.
P. H. Darby, . . . . .	Princeton.
Hon. J. M. Chambers, . . . . .	Independence, Kenton Co.
W. C. Price, . . . . .	Danville.

## MAINE.

E. M. Stilwell,	Bangor.
Henry O. Stanley,	Dixfield.

## MARYLAND.

Thomas Hughlett,	Easton.
G. W. Delawder,	Oakland.

## MASSACHUSETTS.

E. A. Brackett,	Winchester.
Asa French,	South Braintree.
F. W. Putnam,	Cambridge.

## MICHIGAN.

Eli R. Miller,	Richland.
A. J. Kellogg,	Detroit.
Dr. J. C. Parker,	Grand Rapids.

## MINNESOTA.

1st District — Daniel Cameron,	La Crescent.
2d District — Dr. Wm M. Sweney,	Red Wing.
3d District — Dr. Robert Ormsby Sweeny,	St. Paul.
4th District — No appointment until January.	
5th District — No appointment until January.	

## MISSOURI.

Dr. J. G. W. Steedman, Chairman,	2803 Pine Street, St. Louis
John Reid,	Lexington, Lafayette County
Dr. J. S. Logan,	St. Joseph.

## NEBRASKA.

W. L. May,	Fremont.
R. R. Livingston,	Plattsmouth.
B. E. B. Kennedy,	Omaha.

## NEVADA.

Hon. Hubb G. Parker,	Carson City.
----------------------	--------------

## NEW HAMPSHIRE.

George W. Riddle,	Manchester.
Luther Hayes,	Milton.
Albina H. Powers,	Grantham.

## NEW JERSEY.

Dr. Benjamin P. Howell,	Woodbury.
Major Edward J. Anderson,	Trenton.
Theodore Morford,	Newton.

## NEW YORK.

Hon R. Barnwell Roosevelt, . . . 76 Chambers St., New York.  
 Edward M. Smith, . . . . . Rochester.  
 Richard U. Sherman, . . . . . New Hartford, Oneida Co.  
 Eugene G. Blackford (Fulton Market, New York  
 City), . . . . . 809 Bedford Avenue, Brooklyn.

## NORTH CAROLINA.

S. G. Worth, . . . . . Raleigh.

## OHIO.

Col. L. A. Harris, President, . . . . . Cincinnati.  
 Charles W. Bond, Treasurer, . . . . . Toledo.  
 Halsey C. Post, Secretary, . . . . . Sandusky.

## PENNSYLVANIA.

Hon. H. J. Reeder, . . . . . Easton.  
 Hon. B. L. Hewit, . . . . . Hollidaysburg.  
 James Duffy, . . . . . Marietta.  
 John Hummel, . . . . . Selingsgrove.  
 Robert Dalzell, . . . . . Pittsburgh.  
 G. M. Miller, . . . . . Wilkesbarre.

## RHODE ISLAND.

Alfred A. Reed, . . . . . Providence.  
 Newton Dexter, . . . . . Providence.  
 John H. Barden, . . . . . Rockland.

## SOUTH CAROLINA.

A. P. Butler, Commissioner of Agriculture, and *ex*  
*officio* of Fish and Fisheries, . . . . . Columbia.  
 C. J. Huske, Superintendent, . . . . . Columbia.

## TENNESSEE.

W. W. McDowell, . . . . . Memphis.  
 H. H. Sneed, . . . . . Chattanooga.  
 Edward D. Hicks, . . . . . Nashville.

## TEXAS.

R. R. Robertson, . . . . . Austin.

## UTAH.

No appointment since the death of Prof. J. L. Barfoot in April last.



## VERMONT.

Hiram A. Cutting,	.	.	.	.	.	Lunenburg, Essex Co.
Herbert Brainerd,	.	.	.	.	.	St Albans.

## VIRGINIA.

Col. M. McDonald,	.	.	.	.	.	Berryville.
-------------------	---	---	---	---	---	-------------

## WEST VIRGINIA.

Henry B. Miller, President,	.	.	.	.	.	Wheeling.
C. S. White, Secretary,	.	.	.	.	.	Romney.
N. M. Lowry,	.	.	.	.	.	Hinton.

## WISCONSIN.

The Governor, <i>ex officio</i> ,	.	.	.	.	.	Madison.
Philo Dunning, President,	.	.	.	.	.	Madison.
C. L. Valentine, Secretary and Treasurer,	.	.	.	.	.	Janesville.
J. V. Jones,	.	.	.	.	.	Oshkosh.
John F. Antisdell,	.	.	.	.	.	Milwaukee.
Mark Douglas,	.	.	.	.	.	Melrose.
Christopher Hutchinson,	.	.	.	.	.	Beetown.

## WYOMING TERRITORY.

Dr. M. C. Barkwell, Chairman and Superintendent,	.	.	.	.	.	Cheyenne.
Otto Gramm, Secretary,	.	.	.	.	.	Laramie.
Hon. N. L. Andrews,	.	.	.	.	.	Johnson County
Hon. E. W. Bennet,	.	.	.	.	.	Carbon County.
Hon. P. J. Downs,	.	.	.	.	.	Uinta County.
Hon. T. W. Quinn,	.	.	.	.	.	Sweetwater Co.



[B.]

## LIST OF PONDS LEASED.

*By the Commissioners on Inland Fisheries, under Authority given  
by Chap. 384, Sect. 9, of the Acts of 1869.\**

---

### 1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others,  
20 years  
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another,  
20 years.  
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20  
years.  
Oct. 15. Archer's Pond, in Wrentham, to William E. George, 15 years.

### 1871.

- Jan. 10. Nine-Mile Pond, in Wilbraham, to B. F. Bowles, 10 years.  
30. Little Pond, in Falmouth, to F. H. Dimmick, 10 years.  
April -. Spectacle, Triangle, and Peters ponds, in Sandwich, to G. L.  
Fessenden and another, 5 years.  
17. Long Pond, in Falmouth, to Joshua S. Bowerman and three  
others, 20 years.  
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.  
18. Little Sandy Pond, in Plymouth, to William E. Perkins, 15  
years.  
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L.  
Pierce, 20 years.

### 1872.

- Jan. 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to  
James L. Chapin and others, 20 years.  
July 20. Little Pond, in Braintree, to Eben Denton and others, 20  
years.

### 1873.

- May 1. Meeting-house Pond, in Westminster, to inhabitants of West-  
minster, 15 years.

\* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the 1st of October, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

**1873.**

- May 1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Nov. 1. Lake Chaubunagungamong, or Big Pond, in Webster, to inhabitants of Webster, 5 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

**1874.**

- Mar. 1. Walden and White Ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk Ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fullam, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.
11. Hazzard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

**1875.**

- Jan. 1. White and Goose Ponds, in Chatham, to George W. Davis, 15 years.
- Mar. 1. Lake Pleasant, in Montague, to inhabitants of Montague, 10 years.
1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.

## 1875.

- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.  
 3. West's Pond, in Bolton, to J. D. Hurlburt and others, 15 years.  
 15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.  
 24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15 years.  
 1. Great Pond, in North Andover, to Eben Sutton and others, 20 years.  
 1. Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.  
 1. Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.  
 7. West Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.  
 9. Mystic (Upper) Pond, in Winchester, Medford, and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncey and Solomon ponds, in Northborough, to inhabitants of Northborough, 15 years.

## 1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel Thrasher and others, 15 years.
- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.  
 1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.  
 20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.  
 28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.  
 28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.
- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.  
 10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.  
 1. Whitney's Pond, Wrentham, to inhabitants of Wrentham, 15 years.  
 1. Little Pond, in Barnstable, to George H. Davis, 15 years.

**1877.**

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.  
 15. Pentucket and Rock ponds, in Georgetown, to inhabitants of Georgetown, 15 years.  
 Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.  
 Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.  
 1. Battacock Pond, in Groton, to George S. Graves and others, 15 years.  
 Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.  
 1. Asnebumskitt Pond, in Paxton, to Ledyard Bill and others, 15 years.

**1878.**

- Jan. 1. Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.  
 Mar. 16. Asnaconcomic Pond, in Hubbardston, to Amory Jewett, jun., 15 years.  
 April 1. Dorrity Pond, in Milbury, to inhabitants of Milbury, 10 years.  
 May 1. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.  
 1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.  
 July 1. Lake Buell, in Monterey and New Marlborough, to Andrew L. Hubbell and others, 5 years.  
 Oct. 1. Eel Pond, in Melrose, to J. A. Barrett and others, 15 years.  
 1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.  
 1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.  
 1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.  
 Half-way Pond, in Plymouth, taken by Commissioners for 5 years from March 1, 1878, in accordance with provisions of Chap. 62 of the Acts of 1876.

**1879.**

- Feb. 1. Lake Mahkunac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.  
 June 1. "Bald Pate," "Four Mile," and "Stiles" ponds, in Boxford, to inhabitants of Boxford, 10 years.  
 July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.  
 1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.  
 Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.  
 Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield 14 years.

**1880.**

- Jan. 1. Granite-Cove Pond, in Gloucester, to David Babson, 10 years.
- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
- May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.

**1881.**

- Jan. 1. Great and Job's Neck ponds, in Edgartown, to Amos Smith and others, 15 years.
- Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
- May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bullard and others, 15 years.
- April 1. Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.

**1882.**

- Mar. 1. Blair's Pond, in Blandford, to Curtis M. Blair and another, 15 years.
- April 1. Ward Pond, alias Wightman Pond, in Ashburnham, to Herbert F. Rockwood and another, 15 years.
- May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15 years.
- June 1. Wickaboag Pond, in West Brookfield, to inhabitants of West Brookfield, 15 years.
- Oct. 1. Long and Hummock ponds, in Nantucket, to Charles E. Snow and others, 15 years.

## [C.]

## LEGISLATION.

## [CHAP. 160.]

AN ACT relative to the Fisheries in Granite or Goose Cove Pond in the city of Gloucester.

*Be it enacted, etc., as follows :*

SECT. 1. David Babson of Rockport shall have the exclusive right in Granite or Goose Cove Pond in the city of Gloucester for the purpose of cultivating lobsters and other useful fish until the first day of September in the year eighteen hundred and eighty-three.

SECT. 2. This act shall take effect upon its passage. [*Approved April 15, 1882.*]

---

## [CHAP. 65.]

AN ACT for the protection of Striped Bass and Bluefish in the waters of Edgartown.

*Be it enacted, etc., as follows :*

SECT. 1. Whoever at any season of the year shall set, stretch or draw any seine or net of any kind in any of the waters of the town of Edgartown, excepting the Oyster Pond, the Great Pond, and Job's Neck Pond, for the purpose of taking or catching striped bass or bluefish, shall forfeit the sum of one hundred dollars for each offence.

SECT. 2. Whoever shall take or catch at any season of the year in any of the waters of the town of Edgartown, excepting the ponds named in the preceding section, any striped bass or bluefish, by means of any seine or net of any kind, shall forfeit one dollar for each and every fish so taken or caught.

SECT. 3. One-half of the money recovered in any case arising under this act shall be paid to the person making the complaint and the remainder to the Commonwealth.

SECT. 4. This act shall take effect upon its passage. [*Approved March 11, 1882.*]

---

## [CHAP. 53.]

AN ACT for the protection of Traps, Trawls and Seines.

*Be it enacted, etc., as follows :*

SECT. 1. Any person who shall take any fish or lobster from any trap, trawl or seine set for catching fish or lobsters, except by consent of the owner thereof, and any person who shall wilfully molest or interfere with such trap, trawl or seine, shall for the first offence be punished by



a fine of not less than five nor more than twenty-five dollars, or by imprisonment for thirty days, or by both fine and imprisonment; and for any subsequent offence by a fine of not less than twenty nor more than fifty dollars, or by imprisonment for sixty days, or both fine and imprisonment.

SECT. 2. This act shall take effect forty days after its passage. [*Approved March 11, 1882.*]

---

[CHAP. 98.]

AN ACT to provide for the preservation of Lobsters.

*Be it enacted, etc., as follows:*

SECT. 1. Section eighty-one of chapter ninety-one of the Public Statutes is hereby amended to read as follows: —

“SECTION 81. Whoever during the month of July in any year catches or takes from any of the waters of this Commonwealth any female lobster bearing eggs, shall be punished for each offence by a fine of not less than ten nor more than one hundred dollars, or by imprisonment in the house of correction for not less than one nor more than three months; but a person catching or taking any such lobster during said month of July, and immediately returning it alive to the waters from which it was taken, shall not be subject to such penalty.”

SECT. 2. Section eighty-two of chapter ninety-one of the Public Statutes is hereby amended to read as follows: —

“SECTION 82. Whoever during the month of July in any year sells or has in his possession with intent to sell, any female lobster bearing eggs, taken in this Commonwealth, shall forfeit for each offence a sum not less than ten nor more than fifty dollars.”

SECT. 3. This act shall take effect upon its passage. [*Approved March 21, 1882.*]

---

[CHAP. 102.]

AN ACT concerning the Fisheries in Great Pond and Job's Neck Pond in the town of Edgartown.

*Be it enacted, etc., as follows:*

SECT. 1. The lessees holding from the commissioners on inland fisheries a lease of Great Pond and Job's Neck Pond, in the town of Edgartown, may take smelts and alewives from said ponds and from the ditches connecting them with each other and with the ocean, at all seasons of the year and without restriction as to days.

SECT. 2. Whoever other than said lessees takes any fish, except eels, from either of said ponds or ditches, without the permission in writing of said lessees first obtained, shall forfeit one dollar for each fish so taken, and shall also forfeit any boat, net, line, rod or other apparatus used in such taking, in accordance with the provisions of chapter one hundred and ninety-four of the Public Statutes. [*Approved March 21, 1882.*]

## [CHAP. 189.]

AN ACT to regulate the Herring and Shad Fishery in Cole's River and its tributaries, and in Milford Pond, in the county of Bristol.

*Be it enacted, etc., as follows :*

SECT. 1. The town of Swanzey is authorized to create herring and shad fisheries in Cole's River and its tributaries, and in Milford Pond, so called, in the county of Bristol ; and the right to take herring or shad from said river or its tributaries, or from said pond, is suspended for the period of three years next ensuing after the passage of this act ; and no net, seine or weir shall be set therein during said period except as hereinafter provided. The fish wardens chosen as provided by section three of this act may, however, take or cause to be taken from said river or its tributaries, or from said pond, at any time after the passage of this act, such herring or shad as may be required for the purpose of stocking said pond or any of the tributaries of said river.

SECT. 2. The town of Swanzey may sell at public auction, at a legal town meeting to be held in March in the year eighteen hundred and eighty-five, two privileges to take herring and shad from Cole's River from the first day of April to the first day of July in each year, for a period not exceeding five years, as hereinafter provided, at such places on said river as shall be designated by such fish wardens. The purchaser or purchasers of such privilege may take herring and shad with one seine, at the places so designated, from sunrise on Monday until sunset on Wednesday in each week during such period ; but no herring or shad shall be taken in any manner from said waters after the first day of July in each year.

SECT. 3. The town of Swanzey, at its annual meeting in March in each year, may choose two or more suitable persons as fish wardens, who shall be sworn to the faithful discharge of their duties, and shall cause this act to be enforced and shall prosecute all violations of its terms. The fish wardens so chosen shall prevent and remove all unlawful obstructions in the course of said river or its tributaries to the passing up and down of the said fish from the first day of April to the first day of July in each year ; and may, for the purposes of this act, go upon and pass over the land of any person through or by which said river or any tributary thereof runs, or which borders upon said pond, without being considered trespassers : *provided*, that any person sustaining damage in his property may have the same assessed in the manner provided when land is taken for highways. Whoever wilfully hinders or molests any such fish warden, or any person authorized by such fish wardens, in the necessary clearing of said river or its tributaries, and in the necessary and proper use of lands on said river or its tributaries, or said pond, for creating and protecting the said fishery, shall forfeit and pay a sum not exceeding twenty dollars for each offence, to be recovered in the manner provided in section four of this act.

SECT. 4. If any person other than those who have purchased such privilege as aforesaid fishes with a seine or net at any time or in any

manner, or sets any net, seine, weir, or other obstructions in any part of said river or its tributaries, or of said pond, with intent to take or destroy any shad or herring, he shall forfeit and pay twenty dollars for each offence, to be recovered on complaint, one-half to the use of said town of Swanzey and one-half to the use of the person who shall give information leading to the prosecution and conviction of such offender; and all seines, nets or weirs so used or set shall be forfeited to the person who shall give such information.

SECT. 5. All laws relating to fishing in Cole's River are repealed.  
[Approved April 29, 1882.]

---

[CHAP. 166.]

AN ACT relative to Fishing in the Merrimack River.

*Be it enacted, etc., as follows:*

SECT. 1. The penalties provided by chapter ninety-one of the Public Statutes relative to fishing in the Merrimack River shall not apply to or be in force against any person drawing a net or seine after the twentieth day of June in each year at any point below the Essex Merrimack Bridge in said river, unless such person shall take salmon or shad, nor shall a person taking a salmon or shad while thus lawfully fishing and immediately returning it alive to the waters from which it was taken be liable to any of the aforesaid penalties.

SECT. 2. No penalty shall be incurred by any one taking sturgeon in the tidal waters of the Merrimack River: *provided*, that no net or seine having a mesh which stretches less than twelve inches shall be used in taking the same.

SECT. 3. This act shall take effect upon its passage. [Approved April 19, 1882.]

## [D.]

## RETURNS OF WEIRS, SEINES AND GILL-NETS.

Returns to the close of the season (Oct. 20, 1882), have been received from 85 weirs, 33 sea-seines, and 100 gill-nets, an increase of 21, 16, and 39 respectively over the previous year.\* These returns show an *increase* in the catch of shad (50 per cent.), alewives (44 per cent.), mackerel (93 per cent.), Spanish mackerel (281 per cent., but the total catch was only 397), striped bass (129 per cent.), tautog (47 per cent.), flounders and flat-fish (52 per cent.), white perch (162 per cent.). There were also given on the returns, 1,525 bonito, 4,665 "sea bass," and 175 rock bass.

The returns show a *decrease* in the catch of menhaden (68 per cent.), sea herring (7 per cent.), bluefish (8 per cent.), scup (14 per cent.), squeteague (15 per cent.), frost-fish (66 per cent.), eels (17 per cent.), and smelts (2 per cent.).

There was also a large falling off in the catch of shad in the Connecticut and Merrimack rivers, while in the Taunton River the catch of shad was more than double that of last year. There were 292 shad taken at the mouth of the Merrimack, and 897 are returned from other streams.

In the river fisheries there is a decided falling off in the catch of alewives, and a gain in that of striped bass. The two seines at the mouth of the Merrimack return a catch of 193,800 bluebacks.

\* Several returns received after the tables were made up are not included in this summary. They would not materially change the percentage given.

---

---

# TABLES.

---

---

TABLE NO. 1.—PONDS AND WEIRS.—Showing the Catch of each during 1882.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Squeeteague.	Mackerel.	Spanish Mackerel.	Tautog.	Flounders and Flat-fish.	Scup.	Menhaden.	Bluefish.	Eels.
Manchester, .	John G. Heath, .	27	7,253	2	15,400	-	15,757	-	19	32	-	-	13	200
" .	Jones Bros., .	-	22,900	-	6,350	-	18,303	-	-	-	-	-	-	-
Hingham, .	Thomas Weston, .	-	-	-	297	-	-	-	-	-	-	-	-	-
Centreville, .	T. F. Phinney, .	1,765	5,519	-	19,785	78	136	-	160	258	185,177	333	500	5
Brewster, .	Freeman Atwood, .	88	-	553	4,542	-	2,065	-	196	-	-	-	996	34
" .	James Eldredge, .	20	-	154	460	-	5,225	-	-	-	-	-	1,123	-
" .	N. Nelson, .	125	4,000	-	-	-	132,800	-	-	-	-	-	-	-
" .	V. B. Newcomb & Co., .	990	-	-	12,300	-	165,700	-	365	-	-	-	-	-
" .	Parker & Ellis, .	44	-	164	504	-	623	-	139	329	-	-	290	-
" .	J. R. Wixon, .	159	-	-	8,292	-	156,864	-	103	-	-	-	-	-
East Brewster, .	T. Ellis, jun., .	-	1,980	155	650	-	-	-	-	-	-	-	3,159	-
" .	Ellis & Cahoon, .	50	-	47	3,405	-	500	-	30	-	-	-	7,627	-
" .	Z. H. Rodgers, .	57	-	17	-	-	1,822	-	28	-	-	-	607	-
Orleans, .	Isaac Hopkins, .	104	-	6	-	-	13,755	-	-	-	-	-	1,613	-
" .	Warren Hopkins, .	233	-	6	-	-	16,052	1	19	-	1	-	2,994	-

"	R. E. Oliver,	146	400	51	1,300	-	25,225	-	97	-	-	10,664	-
"	Wallace A. Smith,	-	-	-	-	-	5,250	-	-	-	-	-	-
"	A. L. Walker,	54	-	31	200	-	10,745	-	95	-	-	9,843	-
Eastham,	William H. Dill,	-	-	-	-	-	2,312	-	-	-	-	82	-
"	O. W. Horton,	-	-	-	-	-	2,600	90	-	-	-	2,922	-
"	N. M. Knowles,	-	-	-	-	-	4,182	-	-	-	-	6,453	-
"	W. H. Nickerson,	-	-	-	-	-	10,329	-	-	-	-	7,899	-
"	James Savage,	-	-	-	-	-	149,950	-	-	-	-	8,180	-
"	Philip Smith,	-	-	-	-	-	125,935	-	-	-	-	31,550	-
South Eastham,	I. H. Horton,	-	-	-	-	-	137,000	-	-	-	-	11,360	-
Provincetown,	Isaac B. Lewis,*	-	3,320	177	-	-	3,571	-	-	4,8	-	13	-
North Truro,	Atkins Hughes,	88	104,467	-	-	-	419,577	-	8	1,083	-	372	-
"	P. L. Paine & Co.,	516	74,747	-	42,720	1	435,472	-	291	17,070	85	1,284	1
Truro,	N. R. Parsons,	50	43,152	-	32,730	50	186,394	-	28	3,069	-	2,004	304
Chatham,	S. F. Bearse,	1,148	-	-	101,450	-	154,835	-	-	-	-	-	-
"	Czar Weir Co.,	976	141,800	-	94,200	50	170,230	-	103	956	3,025	14	12
"	Stephen W. Gould,	4,128	153,025	10	132,202	11	148,952	-	211	1,218	5,129	459	-
"	Andrew Harding,	2,408	390,450	-	12,943	1	184,855	-	-	-	12	6	-
"	Reed Loveland & Co.,	3,112	198,800	-	171,049	22	225,252	-	309	-	-	228	-

\* Also, 22,423 mackerel by drag-net.

TABLE NO. 1.—PONDS AND WEIRS.—*Showing the Catch of each during 1882.*—Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwates.	Squeteague.	Mackerel.	Spanish Mackerel.	Tautog.	Flounders and Flat-fish.	Scup.	Menhaden.	Bluefish.	Pels.
Harwich, . . .	J. N. Eldredge, . . .	1,059	-	1	19,066	15	20,568	-	428	90	67,473	227	141	7
" . . .	Robbins & Clark, . . .	576	5,671	1	12,419	-	42	-	-	349	-	-	-	-
" . . .	D. F. Weeks, . . .	1,510	10,395	24	46,100	18	248	-	41	2,415	479	1,790	133	-
Dennis, . . .	A. T. Chase, . . .	353	-	1	37,800	-	82,860	-	-	-	-	-	1,858	-
" . . .	Warren Crowell, . . .	-	-	-	2,830	-	-	-	-	-	-	-	-	-
" . . .	Deep Water Weir Co., . . .	220	-	8	5,750	-	212,467	-	66	118	3	-	290	-
" . . .	Nobscussett Fish Weir Co., . . .	2	-	1,177	-	-	920	-	-	-	-	-	2,402	-
" . . .	Joshua Pierce, . . .	-	-	-	-	-	-	-	-	-	-	-	3,256	-
Waquoit, . . .	T. J. Phinney, . . .	790	1,873	21	60,617	73	352	-	191	6,256	10,587	1,823	93	23
Woods Holl, . . .	Warren F. Sears, . . .	-	-	-	-	303	-	-	-	172	24,893	-	41	-
Falmouth, . . .	Prince M. Stuart, . . .	333	-	1	4,943	632	3,298	3	1,129	963	96,850	-	366	-
" . . .	Woods Holl Weir Co.,* . . .	160	-	-	8,800	1,271	28,824	-	839	501	116,825	-	709	-
Mattapoisett, . . .	A. B. Bowman, . . .	31	-	-	14,739	1,578	-	-	606	1,794	28,869	-	1,779	-
" . . .	J. B. Dunn, . . .	3	3	-	10,253	1,925	-	-	801	880	58,961	4	14	50



Fairhaven,	J. C. & J. J. Allen,	12	-	52	11,510	287	17	-	2,420	925	27,439	5	18	175
"	W. H. Bryant,	3	322	6	454	112	16	-	104	670	7,138	433	30	6
"	D. W. Deane, No. 1,	9	-	2	7,833	105	-	-	484	1,104	254	-	-	309
"	D. W. Deane, No. 2,	25	9	40	16,803	174	-	-	2,219	3,848	33,072	27	68	292
"	D. W. Deane, No. 3,	2	3	53	8,159	370	4,041	3	4,185	4,326	50,887	986	945	1,514
"	Benj. T. Dunn,	10	-	14	4,643	92	-	-	110	327	4,179	35	18	97
"	Samuel P. Dunn,	180	-	126	50,294	506	5	-	4,620	1,986	41,866	206	131	181
"	Geo. S. Hiller,	34	-	28	33,636	285	358	4	2,915	1,886	45,958	-	60	53
"	E. Mott,	24	-	1	13,218	52	31	-	1,107	390	6,084	3	29	-
"	R. W. Pease,	5	555	21	5,875	383	-	-	812	642	555	-	19	28
"	D. C. Potter,	11	27	12	14,583	585	-	-	565	880	27,249	111	41	169
"	Chas. D. Sherman,	17	1	19	14,479	237	22	-	1,435	588	14,376	19	20	185
"	Geo. R. Wixon,	18	1,925	14	10,216	212	-	-	276	405	6,072	48	170	231
Chilmark,	Richard Flanders,	399	2,450	-	2,600	1,578	8,554	-	325	6,643	71,160	-	720	-
"	H. O. Poole,	49	-	-	21,765	2,922	5,397	-	88	9,644	19,007	3	623	-
"	Daniel Vincent,	2	-	17	500	286	12,446	-	66	3,900	24,165	-	1,650	-
South Dartmouth,	John W. Cooke,	105	-	73	21,419	233	-	-	188	212	34	-	11	60
"	John Mendus,	129	4,003	22	-	491	-	54	369	743	2,737	-	5	-

\* Also, 665 sea bass.

TABLE NO. 1.—PONDS AND WEIRS.—Showing the Catch of each during 1882.—Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwives.	Squeteague.	Mackerel.	Spanish Mackerel.	Tautog.	Flounders and Flat-fish.	Scup.	Menhaden.	Bluefish.	Pels.
South Dartmouth, .	Nicholas Priaule,	132	4,299	59	537	761	168	64	1,394	3,275	7,210	1,072	132	49
" "	Jonas Travers,	682	13,277	73	369	11,496	92	-	1,482	2,095	111,131	86	84	2
Dartmouth, .	Joseph F. Briggs,	444	4	46	16,538	1,247	13	-	387	879	14,900	108	89	-
" "	James Cook,	-	639	-	-	-	1,091	-	-	1	-	55	30	-
" "	F. B. Manchester,	176	114	18	14,205	92	63	-	354	1,450	113,417	32	77	-
" "	Geo. A. Snell,	462	-	21	20,528	6,263	86	1	586	1,395	186,600	-	253	-
" "	Snell & Crapo,	223	-	349	31,595	2,285	-	-	622	1,227	6,177	94	463	-
" "	Alvin F. Walte,	1,976	-	97	30,561	9,667	270	38	4,350	7,184	108,312	-	1,289	-
Fall River, .	John O. Babbitt,	-	-	1	-	33	-	-	136	1	1	-	2,641	-
Tisbury, . . .	Obed. S. Daggett,	835	-	152	58,542	2,810	197	8	190	3,010	33,571	60	1,051	-
North Tisbury, .	E. C. Flanders,†	200	-	150	11,000	210	2,850	-	-	560	59,400	-	-	-
West Tisbury, .	Amos Smith,	-	-	3	93,006	-	-	-	-	-	-	-	-	-
Nantucket, . .	W. I. Fisher,	-	-	-	-	-	-	-	-	-	-	-	2,358	-
Gosnold, . . .	Charles C. Allen,	66	-	2	4,095	5,763	635	2	511	2,250	68,250	-	522	-
" "	Charles C. Church,	18	135	1	1,550	2,762	5,328	1	226	1,498	126,930	50	99	-

Leonard A. Luce,	1	-	17	8,580	1,679	4	585	3,531	435	15	27	-
Charles C. Murphy,	141	3,907	2	2,427	404	623	117	1,009	24,915	43	399	-
W. G. Rathbun,	52	-	-	4,400	5,100	-	410	885	101,600	-	325	-
L. A. Luce,	2	24	122	903	1,756	58	572	3,089	48,010	18	81	29
Total,	27,769	1,201,449	4,219	1,420,919	67,266	3,289,512	40,512	114,843	1,991,480	8,102	133,805	4,016

† Also, 4,100 sea bass, and 1,525 bonito.

TABLE NO. II. — SALT-WATER SEINES. — Showing the Catch of each for 1882.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Mackerel.	Squeteague.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Eels.	Frostfish.	White Perch.	Smelts.	Spanish Mackerel.
Provincetown, . .	Solomon Bangs, . .	-	1,500	-	-	-	900	-	-	-	1,000	-	-	-	-	-	-
" . .	William Dyer, . .	-	7,818	-	-	-	6,140	-	-	-	419	-	-	-	-	-	-
" . .	Thomas K. Paine, . .	-	9,633	-	-	-	-	-	-	-	1,962	-	-	-	-	-	-
North Truro, . .	Stephen Lewis, . .	-	-	1	-	-	-	-	-	-	778	-	-	-	-	-	-
Eastham, . .	Russell Doane, . .	-	-	-	-	-	-	-	-	-	4,305	-	-	-	-	-	-
" . .	Edmund F. Knowles, . .	56	-	7	94	-	470	810	97	20	4,127	-	100	-	-	-	-
" . .	Walter O. Knowles, . .	-	-	-	332	-	11,070	-	-	-	5,064	-	-	-	-	-	-
" . .	Lewis Lombard, . .	-	-	-	-	-	-	-	-	-	5,294	-	-	-	-	-	-
Chatham, . .	Horatio Howes, . .	-	-	306	-	-	-	-	-	-	1,618	-	-	-	-	-	-
" . .	Alpheus Mayo, . .	-	-	51	-	-	-	-	-	145	662	-	-	-	-	-	-
Yarmouth, . .	Hiram E. Baker, . .	292	-	13	12,460	1	2	2	-	123	-	5	61	-	-	-	-
" . .	D. B. Crocker, . .	13	4	698	6	1	3,164	-	2	-	1,443	-	-	-	-	-	-
Hyannis, . .	B. F. Lumbert, . .	7	-	1	-	1,453	-	-	-	-	1,794	5	-	-	-	-	-
" . .	Henry C. Lumbert, . .	13	-	-	-	7,080	-	-	-	-	2,103	-	-	-	-	-	-
Barnstable, . .	James A. Fish, . .	-	-	-	-	1,962	-	-	585	-	1,445	-	-	-	-	-	6
Westport, . .	Samuel G. Allen, . .	-	-	3	6,421	-	-	-	1	-	-	-	22	-	574	-	-

"	Perry Kirby, . . .	478	-	-	-	-	-	-	229	-	-	42	565	-	-
"	Perry G. Potter, . . .	3	5,368	-	-	-	-	-	-	-	-	31	-	-	-
Osterville, . . .	H. & J. Crosby, . . .	187	-	2,551	-	-	-	177	503	7,094	-	-	-	-	-
Marion, . . .	Hammond & Sisson, . . .	1,050	-	-	-	-	-	-	9	-	-	40	-	-	-
"	J. A. Arnold, . . .	-	-	-	-	-	-	-	-	143	-	-	-	-	-
"	Benjamin Bowditch, . . .	-	-	-	-	-	-	-	-	69	-	-	-	-	-
"	Charles A. Clarke, . . .	-	-	97	-	-	-	66	-	214	-	-	-	-	-
"	James Mandell, . . .	-	-	-	-	-	-	78	-	-	-	-	-	-	-
"	H. Morgan, . . .	1	9,600	40,770	-	27	659	-	-	2,288	-	-	-	-	-
West Tisbury, . . .	John W. Mayhew, . . .	-	17,024	-	-	-	-	-	-	-	-	-	-	-	-
Tisbury, . . .	Allen Look, . . .	10	94,513	-	-	-	142	-	-	-	-	-	-	28,050	-
Edgartown, . . .	Allen Mayhew, . . .	-	-	-	-	-	-	-	-	1,202	-	-	-	-	-
"	J. H. Smith, . . .	-	16,475	-	-	-	514	-	-	-	-	2,640	17,625	6,500	-
"	E. B. Vincent, . . .	-	23,550	-	-	-	-	-	-	-	-	-	-	-	-
Nantucket, . . .	Isaac P. Dunham, . . .	-	-	60	-	-	-	-	-	992	-	-	-	-	-
Sandwich, . . .	Geo. F. Hoxie, . . .	-	-	-	-	1,973	-	-	-	577	-	-	-	-	-
Dennis, . . .	Nathan Kelly, . . .	838	-	-	-	-	-	-	755	10,370	-	-	-	-	-
Total, . . .	. . .	1,222	20,005	1,280	186,321	53,975	23,717	839	2,321	1,784	51,963	10	2,936	665	34,550
															6

TABLE NO. III. — GILL-NETS. — Showing the Catch of each for 1882.

TOWN OR PLACE.	PROPRIETOR.	Shad.	See Herring.	Striped Bass.	Alwives.	Scup.	Squeteague.	Spanish Mackerel.	Mackerel.	Tautog.	Flounders and Flat-fish.	Bluefish.	Menhaden.	Rel.
Barnstable,	W. F. Carney,	2	-	-	-	-	-	-	2	-	-	1,769	-	-
"	David Rogers,	-	-	-	-	305	-	-	-	-	-	3,841	-	-
"	Moses Sturges,	-	-	-	-	-	-	-	-	-	-	326	-	-
Dennis,	Zenos H. Baker,	1	-	-	-	891	11	-	-	14	-	1,706	-	-
"	Freeman S. Crowell,	-	-	-	-	-	-	1	-	-	-	449	-	-
"	Venez Kelley,	-	-	-	-	-	-	-	-	-	-	1,278	-	-
Wellfleet,	W. F. Pierce,	65	40,280	-	-	-	-	-	116,491	148	1,810	13,283	-	-
"	W. F. Pierce, Jr.,	-	-	-	83,618	-	-	-	-	-	-	6,547	-	-
"	Warren Newcomb,	-	-	-	-	-	-	-	-	-	-	-	-	-
"	H. S. Rodgers,	-	-	-	-	-	-	-	-	-	-	5,763	-	-
Provincetown,	James F. Atkins,	-	-	-	2,840	-	-	-	10,687	-	-	493	-	-
"	D. W. Atwood,	1	7,682	-	-	-	-	-	-	761	-	5,845	-	-
"	R. Atwood,	-	5,560	-	-	-	-	-	-	-	-	-	-	-
"	Dan. F. Bangs,	-	4,850	-	-	-	-	-	5,400	-	-	1,629	-	-
"	F. M. Bowley,	-	-	-	-	-	-	-	610	-	-	-	-	-
"	Joseph M. Caton,	-	13,500	-	-	-	-	-	2,175	-	-	-	-	-

[illegible]

TABLE No. III. — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alwives.	Scup.	Squeteague.	Spanish Mackerel.	Mackerel.	Tautog.	Flounders and Kat-fish.	Bluefish.	Menhaden.	Wels.
Provincetown,	Benjamin Lewis,	6	16,661	-	16	20	-	20	17,887	-	1,355	2,285	1	-
"	George Lewis,	-	-	-	-	-	-	-	15,998	-	-	1,756	-	-
"	John A. Lewis,	-	12,100	-	-	-	-	-	22,595	-	-	-	-	-
"	John H. Little,	-	-	-	-	-	-	-	1,270	-	-	1,177	-	-
"	Charles Loring,	-	2,035	-	-	-	-	-	5,903	-	-	507	-	-
"	Joseph Mayo,	35	33,662	-	-	-	-	-	45,293	-	-	1	-	-
"	Lysander Mayo,	-	-	-	-	-	-	-	4,206	-	-	-	-	-
"	David Newcomb,	-	367	-	-	-	-	-	1,460	-	-	-	-	-
"	James G. Rand,	-	17,415	-	-	-	-	-	30,025	-	-	-	-	-
"	Reuben Ryder,	-	3,950	-	-	-	-	-	6,479	-	-	1,231	-	-
"	Edward Sears,	-	2	-	36	-	-	-	3,157	-	-	5	-	1
"	Joseph Sears,	-	21,624	-	-	-	-	-	30,449	-	-	660	-	-
"	Isaac Small,	-	-	-	-	-	-	-	474	-	-	847	-	-
"	Lot Small,	-	2,310	-	-	-	-	-	3,737	-	-	972	-	-
"	H. N. Smith,	-	1,200	-	-	-	-	-	3,048	-	-	868	-	-
"	Jonathan Sparrow,	-	6,520	-	-	-	-	-	-	-	-	-	-	-





TABLE No. III. — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Striped Bass.	Alewives.	Scup.	Squeeteague.	Spanish Mackerel.	Mackerel.	Tautog.	Flounders and Flat-fish.	Bluesh.	Menhaden.	Eels.
Chatham, . . . . .	Jesse Gill, . . . . .	-	4,640	-	-	-	-	-	4,610	-	-	-	-	-
" . . . . .	John Gould, . . . . .	-	-	-	748	-	-	-	1,687	-	-	4,013	-	-
" . . . . .	James F. Smith, . . . . .	-	-	-	-	-	-	-	6,285	-	-	-	-	-
" . . . . .	John M. Smith, . . . . .	-	-	-	-	-	-	-	1,483	-	2,500	1,796	-	-
Hyannis, . . . . .	David Bearse, . . . . .	-	-	-	-	-	6	-	-	-	-	179	-	-
Centreville, . . . . .	C. E. Bearse, . . . . .	-	-	-	-	1,728	11	-	-	-	-	2,615	-	-
" . . . . .	William Hallett, . . . . .	1	-	-	-	980	6	-	-	-	-	1,941	-	-
" . . . . .	Herbert Kelley, . . . . .	-	-	-	-	1,654	-	-	-	-	-	1,714	-	-
Cotuit, . . . . .	David P. Nickerson, . . . . .	-	-	-	-	4	-	-	-	32	-	1,292	-	-
Falmouth, . . . . .	O. P. Handy, . . . . .	-	-	-	-	88	89	-	-	8	2	1,460	6	-
" . . . . .	R. T. Handy, . . . . .	352	938	60	86,089	899	387	-	22	666	4,502	108	595	44
Matapoisett, . . . . .	Alex. B. Bowman,* . . . . .	-	-	-	-	1,095	476	8	3	-	515	770	-	-
Fairhaven, . . . . .	Robert Blythe, . . . . .	-	-	-	-	705	90	-	-	16	-	2,243	1	-
" . . . . .	D. W. Deane, . . . . .	-	-	-	-	927	66	12	-	7	-	1,345	11	-
" . . . . .	George R. Deane, . . . . .	10	-	18	12,378	28,504	201	-	16	1,850	1,960	236	-	-
" . . . . .	Samuel P. Dunn, . . . . .	-	-	-	-	-	-	-	11	-	-	86	-	-

"	Ezekiel W. Gould,	.	.	.	.	.	.	.	.	12	-	-	-	-	-	262	-	-
"	Matthew Merry, .	.	.	.	.	.	.	.	.	-	2	-	-	-	-	60	-	-
"	D. C. Potter,	.	.	.	.	.	.	.	.	12	1	-	4	-	-	223	5	-
"	Jared Sherman, .	.	.	.	.	.	.	.	.	-	7	-	-	-	-	319	-	-
"	George R. Wixon,	.	.	.	.	.	.	.	.	1	20	-	-	-	-	73	-	-
Marion,	M. B. Marble,	.	.	.	.	.	.	.	.	14	2	-	414	-	-	1,279	-	-
"	Paine & Sylvia,	.	.	.	.	.	.	.	.	30	1	-	-	-	-	834	4	-
Vineyard Haven,	E. S. Cleveland,	.	.	.	.	.	.	.	.	1,442	6	-	4	18,896	-	15	-	-
Nantucket,	A. H. Adams,	.	.	.	.	.	.	.	.	4,565	-	-	-	-	-	2,457	-	-
"	Horace B. Cash,	.	.	.	.	.	.	.	.	-	-	-	-	-	-	2,939	-	-
"	J. O. Freeman,	.	.	.	.	.	.	.	.	-	-	-	-	-	-	972	-	-
"	Charles K. Manter,	.	.	.	.	.	.	.	.	81	2	1	-	-	-	1,216	-	-
"	Warren F. Ramsdell,	.	.	.	.	.	.	.	.	-	-	-	-	-	-	3,717	-	-
"	Charles E. Snow,	.	.	.	.	.	.	.	.	-	-	-	-	-	-	666	-	-
Total,	.	.	.	.	.	.	.	.	.	290,606	147	238,309	45,071	3,366	81	563,370	3,924	31,703
		516										19,484				136,705	623	97

\* Also with weirs.

TABLE NO. IV. — CONNECTICUT-RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
Agawam, . . . . .	A. J. Hills, . . . . .	364
Longmeadow, . . . . .	A. Converse, . . . . .	292
Chicopee, . . . . .	H. W. Chapin, . . . . .	2,114
Total, . . . . .	. . . . .	2,770

TABLE NO. V. — MERRIMACK-RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
North Andover, . . . . .	Eben Sutton, . . . . .	74	-	-
Haverhill, . . . . .	Chas. E. Ordway, . . . . .	31	-	-
Byfield, . . . . .	Ira P. Newton, . . . . .	-	2,800	-
Amesbury, . . . . .	Jonathan Morrill, . . . . .	282	-	1
Total, . . . . .	. . . . .	387	2,800	1

TABLE NO. VI. — TAUNTON-RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
Berkley, . . . . .	Isaac N. Babbitt, . . . . .	1,924	91,361	-
" . . . . .	F. P. Case, . . . . .	687	108,323	-
" . . . . .	Nichols & Shove, . . . . .	1,900	180,000	-
Dighton, . . . . .	E. & O. M. Buffington, . . . . .	800	90,000	-
" . . . . .	E. Hathaway, . . . . .	2,865	150,000	44
" . . . . .	Chas. N. Simmons, . . . . .	1,800	160,000	-
Middleborough, . . . . .	John Garland, . . . . .	-	47,125	-
Raynham, . . . . .	J. S. Townsend, . . . . .	690	71,148	-
Taunton, . . . . .	John W. Hart, . . . . .	306	81,900	-
Somerset, . . . . .	J. B. Hathaway, . . . . .	200	50,000	-
" . . . . .	Geo. H. Simmons, . . . . .	1	9,415	-
Total, . . . . .	. . . . .	11,173	1,039,272	44

TABLE NO. VII. — *Other Fresh-water Seines, or Dip-net Fisheries.*

TOWN OR PLACE.	NAME.	Shad.	Alewives.	Frostfish.	White Perch.	Striped Bass.
Weymouth, . .	David Tucker, . .	-	152,400	-	-	-
Kingston, . .	Philander Cobb, . .	-	42,015	-	-	-
Plymouth, . .	E. & J. C. Barnes, . .	-	28,864	-	-	-
" . .	Wm. S. Hadaway, . .	-	-	24,000	-	-
" . .	B. F. Hodges, . .	8	20,685	-	-	-
Barnstable, . .	R. Marston, . .	-	11,680	-	-	-
" . .	E. Phinney, . .	-	137,385	-	-	-
Brewster, . .	Job Wixon, . .	-	-	-	-	-
Wellfleet, . .	George Baker, . .	-	8,631	-	-	-
Dennis, . .	Jonathan Bangs, . .	-	280,797	-	-	-
Yarmouth, . .	P. P. Aiken, . .	-	4,524	-	369	-
" . .	David S. Baker, . .	128	4,329	-	-	2
" . .	Benj. Blachford, . .	24	900	-	-	-
" . .	M. Amos, . .	-	24,683	-	-	-
Marshpee, . .	W. H. Simon, . .	-	4,775	-	-	-
" . .	W. R. Mingo, . .	-	16,050	-	-	-
Wareham, . .	Geo. Sanford, . .	-	432,000	-	-	-
Taunton, . .	G. B. Williams, . .	563	164,899	-	-	-
Mattapoisett, . .	A. H. Shurtleff, . .	-	152,666	-	-	-
Westport, . .	C. V. S. Remington, . .	-	10,000	-	-	-
" . .	Philip S. Tripp, . .	50	12,476	-	-	236
" . .	Lysander W. White, . .	-	1,714	-	45	-
South Dartmouth, . .	John Querpel, . .	124	12,820	-	-	-
Chilmark, . .	Estate H. M. Smith, . .	-	27,148	-	-	-
Edgartown, . .	A. Huxford, . .	-	7,318	-	-	-
Total, . . .	. . . . .	897	1,558,659	24,000	414	238

TABLE NO. VIII. — *Seine Fishery at the Mouth of the Merrimack.*

NAME.	Shad.	Alewives.	Bluebacks.
N. Lattimer & A. Hall, . . . . .	-	1,463	-
John Jannin, . . . . .	292	28,150	193,800
Total, . . . . .	292	29,613	193,800







PUBLIC DOCUMENT.

No. 25.

*6783 4464*

*Jan 31/84*

EIGHTEENTH ANNUAL REPORT

OF THE

COMMISSIONERS

ON

INLAND FISHERIES,

FOR THE

YEAR ENDING DECEMBER 31, 1883.

BOSTON:

WRIGHT & POTTER PRINTING CO., STATE PRINTERS,  
18 POST OFFICE SQUARE.  
1884.



EIGHTEENTH ANNUAL REPORT  
OF THE  
COMMISSIONERS  
ON  
INLAND FISHERIES,  
FOR THE  
YEAR ENDING DECEMBER 31, 1883.

---

*With Compliments of*

COMMISSIONERS.

BOSTON:  
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,  
18 POST OFFICE SQUARE.  
1884,



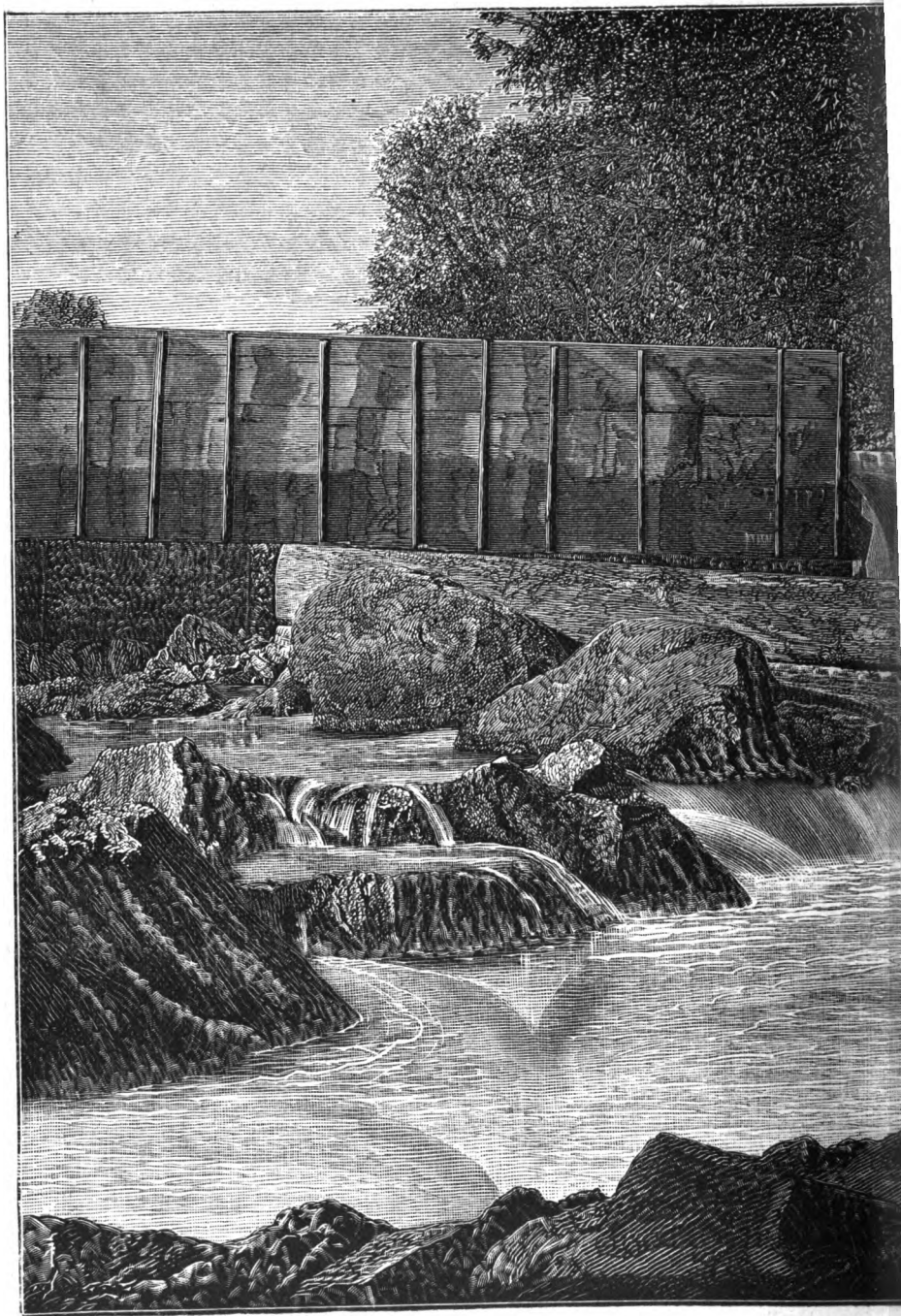
## CONTENTS.

---

	Page
REPORT, . . . . .	5
APPENDIX A. List of Fish Commissioners, . . . . .	33
B. Salmon Breeding Establishment in Maine, . . . . .	39
C. Salmo salar, . . . . .	43
D. Fishway in Norway, . . . . .	47
E. Edible qualities of Carp, . . . . .	56
F. Legislation, . . . . .	88
G. List of Leased Ponds . . . . .	90
H. Returns of Leased Ponds, . . . . .	96
I. Returns of Weirs, Seines, and Gill-nets, . . . . .	104

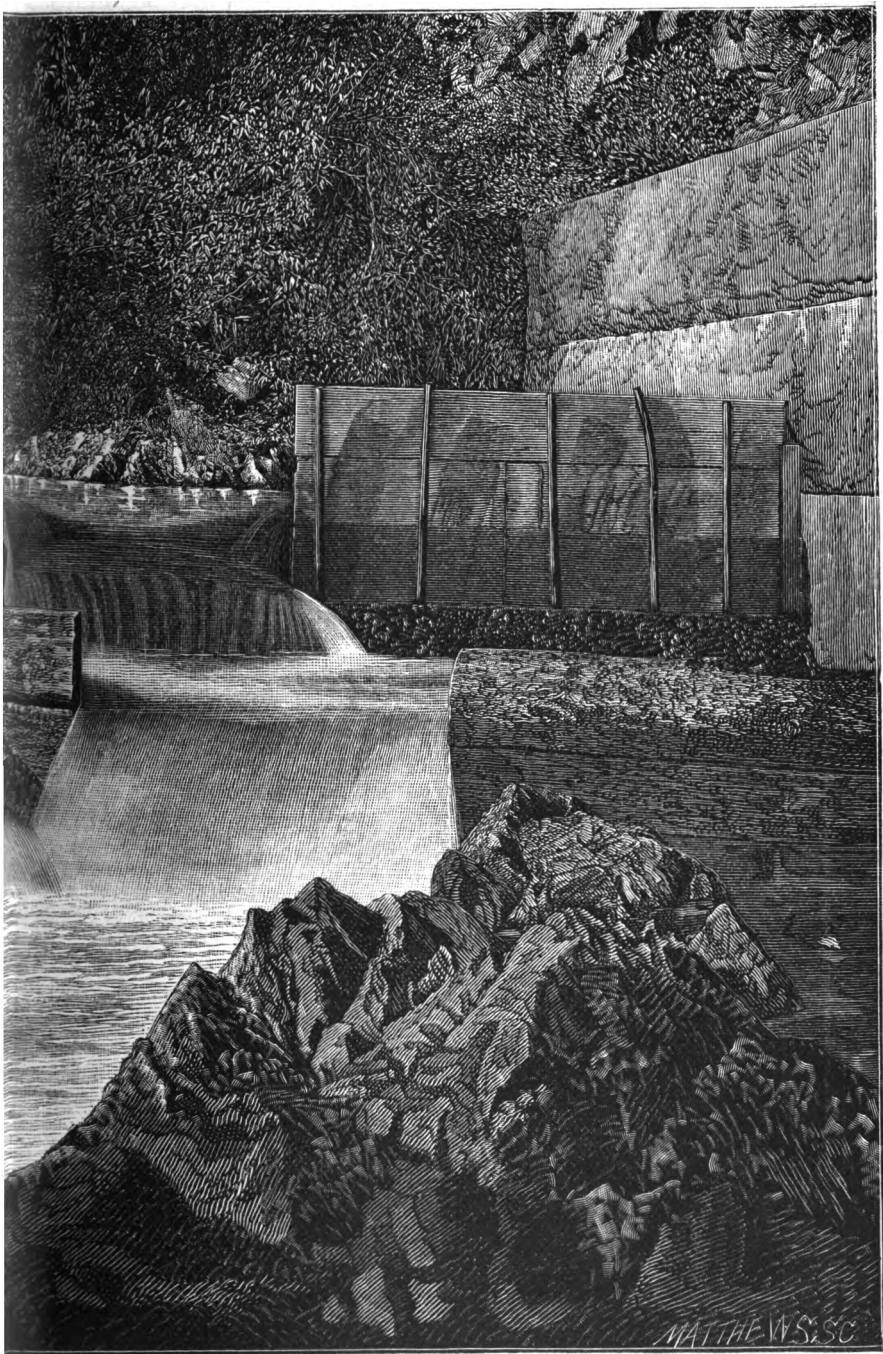






FISHWAY AT PAWTUCKET





DAM, LOWELL, MASS.

To E  
T  
sen'

I  
to  
dar  
har  
sea  
cit  
He  
ap  
gi  
si  
in  
th  
re

a  
st  
C  
s  
a  
i

f  
t

# Commonwealth of Massachusetts.

---

*To His Excellency the Governor and Honorable Council.*

The Commissioners on Inland Fisheries beg leave to present their Eighteenth Annual Report.

## FISHWAYS.

Plans and specifications of fishways have been furnished to two owners of dams on the Acushnet River, and for two dams in South Scituate. As in former years depredations have been committed at the Holyoke fishway. Early in the season a man was recommended by the mayor and prominent citizens of Holyoke, as a suitable person to enforce the laws. He was appointed deputy, and under pretence of authority appointed an assistant, telling him that he had a right to give him permission to take fish from the fishway. The assistant, with others, commenced a thriving business by taking fish from the fishway at night, paying the deputy for the permission. Deputy and assistant were promptly arrested and fined fifty dollars and cost of court.

## PAWTUCKET DAM, LOWELL.

Some misunderstanding has arisen in regard to the fishway at this place, and a petition was forwarded to the Governor, stating that "there is no fishway in this dam," and "the Commissioners have refused to order one," both of which statements are incorrect. A committee of the Council was appointed by the Governor, and the petitioners given a hearing.

In 1866 the Commissioners of this State furnished plans for a fishway which were approved by the New Hampshire Commission, and the Locks and Canal Company were requested to construct the same over their dam. The order

was promptly complied with, the fishway being finished in September of the same year, and for a period of nine years it remained as the only pass at this dam, but with little or no evidence that it was successful.

In 1875 the Company rebuilt their dam, and in so doing special reference was had to a new fishway. Fortunately the dam terminated on the Dracut side in a fall of about two feet, and by blasting a channel in the ledge a natural pass for the fish was secured. This has successfully answered the purpose for eight years, and has proved to be far better than any artificial structure which could have been erected over any part of the dam.

When the new dam was built the old fishway was not connected with it, and the new pass being situated partly under the bank, is not likely to be noticed unless specially sought for. Many of the petitioners supposed that the old fishway was the only provision made for the passage of the fish. This was apparent not only at the hearing, where but three or four of the petitioners appeared, but also from a number of them having since stated that they signed the petition under a misapprehension.

There are difficulties connected with the building of all fishways which have not been overcome.

A fishway which is perfectly successful at a medium stage of water, will with very high or very low water be more or less defective.

While the present fishway at Lowell is one of the best on the river, it is possible that in its details it may be improved, and in this the Locks and Canal Company have always shown a commendable spirit, being ever ready to make such minor changes as the Commissioners have desired. But on the other hand, they have taken the ground that unless good and sufficient reasons can be shown for the expenditure, they will resist any attempts to compel them to build a new fishway.

In the early movements of the Commissioners of this State, they found the rivers barred with dams, some of them of great height, thereby preventing the migratory fish from reaching their spawning grounds. The question of providing passes was a perplexing one and there was little to be gained

from the experience of others. Especially was this true in regard to high dams. It was evident that if good fishways could not be provided, the cultivation of migratory fish to any great extent was impossible. Much perplexity and anxiety was experienced, with no little expenditure of money, on the Lawrence fishway. The difficulty lay largely in the accelerated speed of the water as it descended the pass. All efforts to check this force resulted in producing currents which did not attract the fish upward.

It was while studying these whirlpools and circling currents, produced by efforts to break the force of the water, that it was discovered that fish in their progress up stream, are guided entirely by the current, which they follow regardless of everything else. It matters not what is the outline of the shore or how crooked the stream, so long as there is a continuous thread or current to entice them forward. This led to the discovery and adoption of two forms of fishways: first, the improved Foster, and second, what is now known as the Brackett fishway. Both were invented in 1868, but the latter was not built to any considerable extent until 1872. It is claimed that this will take from the top of any dam, no matter how high, a column of water and land it at the bottom without increase of velocity,—that the current is so slow and the water so unbroken that all kinds of fish can easily pass through it, and that it takes so little water that the manufacturing interest is not seriously injured by it. In this alone it has proved of more value to the State than the total cost of the Commission. Its complete success both here and in Europe has been fully established, marking a new era in fish culture, by making available thousands of miles of rivers heretofore closed to migratory fish. Good fishways lie at the foundation of inland fish culture and whatever tends to improve or make them effective is of great value.

In the Appendix will be found a very interesting description of a fishway spanning a fall of eighty-nine feet, on the river Sire, Norway. This pass has not only been thoroughly tested, but is, by many feet, the highest pass known. The modifications described may be, and doubtless are, desir-

able in so long a fishway (nearly half a mile), but over dams of twenty or thirty feet they are not required. We regret that the plans and drawings intended to accompany the description have not been received. The following letter will explain the cause of delay :—

MR. E. A. BRACKETT.

CHRISTIANA, NORWAY, Nov. 8, 1883.

SIR :—Excuse me that so very long time has been allowed to elapse before answering your letter of February 19, of this year. A description of the fishways on the river Sire was certainly printed for the International Fisheries Exhibition in London; but the drawings that accompanied the description, both in the Edinburgh and London exhibitions, have not been printed, and I am not in position to get a copy of them now. I have been in hopes, however, that at least some of the drawings would be published this autumn, here in Christiana, in a periodical paper for engineering, and this is the reason why I have delayed so long answering your letter. I now understand, however, that the publication most likely will not take place till later on in the winter. I therefore now send you by book-post, a copy of the description, and as soon as the drawings, or any of them, are published, I shall have the pleasure to forward to you a copy of these too.

For the interesting Reports you kindly sent me, please receive my best thanks.

Believe me to be yours very truly,

A. LANDMARK,

*Inspector of Fisheries for Norway.*

#### REPORT OF FISH SEEN IN THE LAWRENCE FISHWAY IN THE YEAR 1883.

- April 22. Water let into the fishway.  
 May 20. Saw the first fish, a lamper eel.  
 20 to } The river was high. There being no flash-boards on the  
 June 4. } south end of the dam, while there were flash-boards  
 the rest of the way, caused a very strong current of  
 water by the end of the fishway, and although I saw  
 a good many alewives and suckers side of the ledge  
 below the fishway, I saw very few in the fishway un-  
 til June 4th, when the river fell some, and the flash-  
 boards were repaired.  
 June 4. Alewives, suckers and chubs, run large.

- June
5. Alewives, lampers, suckers and chubs, run very large.
  6. Alewives, lampers, suckers and chubs, run large.
  7. Alewives, lampers, suckers and chubs, run large.
  8. Alewives, lampers, suckers and chubs, run moderate.
  9. Alewives, lampers, suckers and chubs, run small.
  10. Alewives, lampers, suckers and chubs, run small.
  11. Alewives, suckers and chubs, run small.
  12. Lampers, suckers and chubs, run small.
  13. Alewives, lampers, suckers and chubs, run small.
  14. Alewives, suckers and chubs, run small.
  15. Suckers and chubs, run moderate.
  16. Alewives and suckers, run small.
  17. Suckers and chubs, run moderate.
  18. Alewives, suckers and chubs, run small.
  19. *Two salmon*, 15 to 20 pounds; alewives, lampers, suckers and chubs, run moderate.
  20. *Ten salmon*, 10 to 20 pounds; alewives, lampers, suckers and chubs, run moderate.
  21. Alewives and suckers, run moderate; lampers, run small.
- 22-29. A freshet in the river: never saw the water so muddy before. Scarce any fish in the fishway during this time. Think this very dirty water had a bad effect on the fish, as a salmon 3 feet long, and 17 pounds weight, was found dead in the south canal, shortly after this freshet, without a mark or scar on him.
30. Suckers and chubs, run small.
- July
1. Suckers, chubs and (small) silver eels, run small.
  2. Suckers, chubs and silver eels, run small.
  3. Suckers and silver eels, run small.
  4. Suckers, chubs and silver eels, run moderate.
  5. Suckers, chubs and silver eels, run small.
  6. Suckers and silver eels, run small.
  7. Suckers and silver eels, run small; one large silver eel.
  8. Suckers, run small; silver eels, run large.
  9. Suckers, run small; silver eels, run large.
  10. Suckers, run small; silver eels, run large; one black bass.
  11. Suckers, run small; silver eels, run large.
  12. Suckers and chubs, run small; silver eels, run large.
  13. Suckers, chubs and silver eels, run moderate.
  14. Suckers, chubs and silver eels, run moderate; two black bass.

July 15-25. When water was shut out, on account of the river being low, nothing was seen in the fishway but a few suckers and chubs, and hundreds of small silver eels. During the rest of July, and the months of August and September, the river was remarkably low: water was in the fishway only on Sundays, and not always then. When water was in there were a few suckers, chubs and small silver eels in the way. During part of August and the month of September, there were six salmon lying in the pools at the foot of the dam near the bridge. They were often noticed by people on the bridge, swimming lazily about.

- Oct. 7. Let the water into the fishway, the river having risen.  
9. *Two salmon* in the fishway, 15 to 20 pounds weight. Saw no fish, except a few suckers and chubs, in the fishway after October 9, to November 1.

Mr. Knowles, while making some repairs on the fishway in the spring, notified me that the planking in the bottom of the way was getting rotten. He thought that two-inch planking should be put in, all over the bottom, another year.

I should think if an addition was made to the fishway, down side of the ledge (where the fishway was built first), that it would be a great advantage to the fish when the river is high, as at such a time the water rushes by the end of the fishway, as it is now constructed, with great force.

When the river fell, the water could be shut out of the addition and turned into the present lower end of the way.

If a channel were cut through the rocks, causing a current through the pools below the dam, down to where the river runs under the bridge at low water, it would be quite a help to the fish in a low state of the river. Should think this might be done at small expense. I am informed that there are few ponds above here that alewives can get into to spawn.

Some citizens of Andover undertook to have the town of Andover clean out Fish Brook, so that the alewives could get into Haggett's Pond; but they were defeated at the spring town meeting.

It is evident if the alewives cannot get into the ponds they will not increase.

The black bass seem to have gone up the river; I hear of very few being caught in the river here at Lawrence.

Yours respectfully,

THOMAS S. HOLMES.



Arrangements have been made to re-plank the bottom of the fishway as soon as possible, and to make such other improvements as are desirable, one-half of the expense to be borne by the Essex Company.

### SHAD HATCHING AT NORTH ANDOVER.

*To the Commissioners on Inland Fisheries.*

GENTLEMEN: — We respectfully submit the following report, containing a full account of the work of hatching shad at North Andover for the season of 1883. The hatching was opened June 6, and closed July 12.

Number of shad taken, . . . . .	428
“ returned to water alive, . . . . .	106
“ given away, . . . . .	322
“ males, . . . . .	155
“ females, . . . . .	273
“ striped bass taken (weight 43 pounds), . . . . .	1
“ salmon taken, . . . . .	11
“ “ “ dead, . . . . .	1
“ “ returned to river alive, . . . . .	10
“ alewives taken, . . . . .	80
“ suckers, chubs and eels, . . . . .	220

The amount of shad spawn taken was estimated to be fully 1,607,000, and from this about 1,250,000 fish were hatched. Of this number 650,000 were shipped by rail to the Fish Commissioners of New Hampshire. They were carried in ice-water in twenty-gallon cans, and I am informed by the Commissioners' agent, who had charge of their transportation, that the fish were safely carried, none dying on the route. They were turned into the Merrimac, at Franklin, Fisherville and other points above Concord.

Eighty thousand were turned into the river above the dam at Lawrence, 450,000 at North Andover, and 20,000 sent in charge of Mr Peabody to be put in the Ipswich River.

Fifty thousand died in the hatching boxes while being held over the Sabbath for shipment. The rapid rise of water and sudden fall of temperature, June 23, caused a loss of 200,000 spawn.

The amount of spawn taken was 380,000 in excess of last season, while the number of shad taken was 226 less.

The plank boom in the form of a triangle fully met our expectations, and very much lessened the labor of attendance upon the hatching boxes.

The following table gives the number of shad taken each day, the proportion of males to females, the temperature of the water

and air, the times of hauling the seine, the number of fish taken at each sweep and the estimated amount of spawn secured.

DATE.	Shad taken.	Males.	Females.	TEMPERATURE.		Time of hauling seine.	Fish per sweep.	Estimated amount of spawn taken.
				Water at 7 p.m.	Air at 7 p.m.			
June 6, .	30	18	12	71	76	5, 7, p.m.	20, 10,	000
" 7, .	13	5	8	72	68	6, 7, "	12, 1,	40,000
" 8, .	15	8	7	73	70	5, 6, 8, "	10, 5, 0,	40,000
" 9, .	3	2	1	74	70	5, 8, 9, "	0, 2, 1,	6,000
" 11, .	10	3	7	75	69	6, 7, 9, "	0, 10, 0,	75,000
" 12, .	13	5	8	76	70	7, 8, 9, "	1, 9, 3,	30,000
" 13, .	19	5	14	75	69	7, 8, 9, "	1, 16, 2,	100,000
" 14, .	2	1	1	74	70	7, 9, 10, "	1, 1, 0,	4,000
" 15, .	9	4	5	74	68	7, 9, "	2, 7,	35,000
" 16, .	22	12	10	72	65	8, 9, 10, "	5, 11, 6,	135,000
" 18, .	16	7	9	72	68	8, 9, 10, "	0, 7, 9,	60,000
" 19, .	24	11	13	72	67	7, 8, 9, "	12, 4, 8,	70,000
" 20, .	16	1	15	73	69	7, 8, 9, "	9, 3, 4,	20,000
" 21, .	13	5	8	72	70	8, 9, 10, "	6, 3, 4,	25,000
" 22, .	12	5	7	72	68	7, 8, 10, "	5, 4, 3,	60,000
" 23, .	4	1	3	67	67	1, 3, "	7, 9,	000
" 25, .	26	7	19	71	70	7, 8, 9, "	10, 6, 10,	250,000
" 26, .	30	11	19	72	70	7, 8, 10, "	5, 18, 7,	250,000
" 27, .	19	4	15	72	68	6, 7, 8, "	7, 6, 6,	100,000
" 28, .	19	6	13	73	72	7, 8, 9, "	7, 6, 6,	70,000
" 29, .	18	2	16	74	80	8, 9, 10, "	7, 8, 3,	50,000
" 30, .	13	3	10	75	60	8, 9, 10, "	6, 5, 2,	70,000
July 2, .	13	4	9	74	70	7, 8, 9, "	3, 6, 4,	000
" 3, .	9	3	6	75	71	8, 9, 10, "	3, 1, 5,	30,000
" 5, .	18	7	11	76	75	7, 8, 9, "	6, 4, 8,	50,000
" 6, .	14	8	6	78	80	8, 9, 10, "	3, 5, 6,	25,000
" 7, .	6	3	3	78	80	8, 9, "	3, 3,	000
" 9, .	9	2	7	75	65	8, 9, 10, "	2, 5, 2,	12,000
" 10, .	3	5	5	73	67	7, 8, 9, "	2, 3, 3,	000
" 11, .	5	2	3	76	70	8, 9, "	2, 3,	000

In order to avoid the killing of salmon while fishing for shad, a new seine of two and one-half inch mesh was furnished by the State. It fully accomplished its purpose, none being killed while using it, although several fine ones were taken, varying in weight from fifteen to twenty-five pounds. In using this seine of small mesh many young shad were taken, evidently one and two years of age, being about from four to ten ounces in weight.

We carefully examined these fish and found them to be the same as those taken by fishermen at the mouth of the river and sold under the name of *sea-shad*. The fishermen there claim that this species of shad do not ascend the river; but the taking of them at North Andover has fully demonstrated the fact that a seine of two and one-half inch mesh will take them anywhere on the river for a distance of twenty-five miles from its mouth. It is also claimed that the young shad taken at the mouth of the river are all male fish. Very true; those taken at North Andover, twenty-five miles from the mouth were all male fish. The male shad one and two

years of age follow the mother fish to the spawning grounds in fresh water, while the young female fish whose powers of reproduction are not matured, remain in salt water, the true feeding ground of the shad which ascend our rivers for the purpose of depositing their spawn and for no other purpose; and female shad without spawn are seldom if ever taken in fresh water. Sea-shad, if there is any such fish, must necessarily derive its name from the fact that it is a constant inhabitant of the sea, and, like the codfish finds its spawning ground in salt water.

A careful comparison of the shad taken at the mouth of the river with those taken twenty-five miles above, cannot fail to convince any unprejudiced mind that the term sea-shad is not to be applied to any fish that are caught to any extent in the Merrimac.

The work of hatching shad to re-stock the river is simple in itself, and the number hatched may be increased threefold at a small expense, thereby securing a large return of fish. Notwithstanding this fact it seems to me that your Honorable Board must see the difficulty in attempting to re-stock the river while five or six seines of small mesh are annually destroying thousands of young shad inside of the line fixed by the Governor and Council defining the mouth of the river.

The value of a few hundred barrels of bait, that could be caught elsewhere, is insignificant compared with this destruction of young shad.

In re-stocking the river every available means should be used to protect the young fish, and not *one part* but the interests of the fisheries on the *whole river* should be considered. To allow a few fishermen here and there to control or destroy the entire rights of others is a matter that does not admit of any argument.

The fish-laws of the Merrimac, with the exception of permitting the use of seines of less than two and one-half inch mesh, at the mouth of the river, are ample for all practical purposes. From a careful investigation, extending over a series of years, we are forced to the conclusion that the interests of fish culture demand that these laws should be more thoroughly enforced.

Yours respectfully,

B. P. CHADWICK.

EDWIN F. HUNT.

SEPTEMBER 10, 1883.

BROOK TROUT (*Salmo fontinalis*).

There were received from the Plymouth hatching-house, N. H., last year, 75,000 eggs from which were hatched about 63,000 young fish. This year there is an increase of 50,000, making 125,000. The young fish will be delivered free, at the hatching-house, Winchester, next spring. Persons desiring them should make early application, first, because the cooler the weather the easier to transport them; and secondly, unless all orders are in before any distribution is commenced it is difficult to apportion them. The demand is greatly in excess of the supply; but arrangements have been made to cover the deficiency as soon as possible. The distribution last spring was as follows:—

	CANS
Henry Goulding, South Natick, . . . . .	1
Geo. W. Cowden, Rutland, . . . . .	1
W. H. Foote, Westfield, . . . . .	3
A. L. Hubbell, Great Barrington, . . . . .	3
John Alden, Stoneham, . . . . .	3
H. H. Wyman, Winchendon, . . . . .	1
Geo. Kellogg, Sheffield, . . . . .	2
Ivers Adams, Dorchester, . . . . .	2
Eben Sutton, North Andover, . . . . .	1
S. W. Lincoln, Adams, . . . . .	1
S. L. Lincoln, " . . . . .	1
Geo. H. Weld, Rochester, . . . . .	1
Geo. T. Newbegin, Salem, . . . . .	1
Alex. McDonald, Jamaica Plain, . . . . .	1
Wm. H. Means, Tewksbury, . . . . .	1
D. White, Oxford, . . . . .	1
M. O. Adams, Ashburnham, . . . . .	1

## LAKE SUPERIOR SALMON TROUT.

One hundred thousand eggs of this trout were received last fall from Mr. Welsher, of Milwaukee, Wis., from which 90,000 young, healthy fish were obtained.

These fish are for large and deep ponds, and are not suitable for shallow waters.

It is probable that about the same number will be for distribution next spring.

Those of last year were distributed as follows :—

	CANS.
Will Perham, Tyngsborough, . . . . .	1
A. L. Hubbell, Great Barrington, . . . . .	1
John Cort, Webster, . . . . .	2
H. H. Wyman, Winchendon, . . . . .	1
D. R. Dean, Oakham, . . . . .	1
S. S. Thompson, Globe Village, . . . . .	1
W. S. Holbrook, Sutton, . . . . .	2
George H. Weld, Rochester, . . . . .	1
Charles Goshlau, Oxford, . . . . .	1
W. H. Wheeler, Millbury, . . . . .	2
M. H. A. Evans, Graniteville, . . . . .	2
George H. Poor, Andover, . . . . .	2
Enos W. Boise, Blandford, . . . . .	1
Nathaniel Wales, Stoughton, . . . . .	2
George M. French, Holliston, . . . . .	1
Daniel Crosby, Stoneham, . . . . .	1
Herbert F. Rockwood, Boston, . . . . .	1
Thomas Lawrence, Falmouth, . . . . .	2
C. A. Bronson, Ashfield, . . . . .	1

#### RAINBOW OR CALIFORNIA MOUNTAIN TROUT (*Salmo iridae*).

Through the kindness of Prof. Baird, 3,000 eggs of these fish were received last spring, from which about 2,500 fry were obtained.

It was intended to send them to the Plymouth (N. H.) hatching-house for breeding fish, but, through mistake, this was delayed so long that it was thought best to dispose of them in other ways, and they were placed in a stream under the care of Hon. John Cummings, where they will be looked after, and their adaptation to streams in this climate tested.

#### LAND-LOCKED SALMON. (*Salmo sebago*.)

Last year there was received from the Schoodic establishment, about 195,000 eggs of this fish. They came in excellent condition and hatched well, and were distributed as follows :—

	CANS.
J. S. Howe, Shrewsbury, . . . . .	2
J. W. Winslow, West Brewster, . . . . .	4
Myron W. Whitney, Boston, . . . . .	2

	CANS*
H. H. Wyman, Winchendon . . . . .	1
Ivers Adams, Dorchester, . . . . .	3
W. S. Holbrook, Sutton, . . . . .	4
B. P. Chadwick, Bradford, . . . . .	1
William Lawrence, Worcester, . . . . .	4
Thomas Lawrence, Falmouth, . . . . .	4
Abishar Phinney, Waquoit, . . . . .	4
H. F. Rockwood, Boston, . . . . .	3
W. A. Bullard, Cambridgeport, . . . . .	4
A. L. Hubbell, Gt. Barrington, . . . . .	2
Erastus Howes, Gloucester, . . . . .	1
— Hull, Stockbridge, . . . . .	6
John Loring, Boston, . . . . .	2
Mystic River, . . . . .	6

The number of fish in the cans varied, intentionally, according to temperature and the distance to which they were to be transported. The average number to a can was about 3,500.

The amount due this State this year is somewhat less, being only about 120,000.

#### ATLANTIC SALMON (*Salmo salar*).

For the amount of spawn received by the State from the Penobscot establishment last season, and for the distribution of the young fish, see Report of Commissioner Hodge, Superintendent of the State Hatching-house, at Plymouth, N. H.

As the Penobscot establishment for Atlantic salmon, and the Schoodic for land-locked salmon spawn, are the sources of supply of spawn of these fish, we append a description of them by Chas. G. Atkins, Asst. U. S. Commissioner and Superintendent of these works. It was intended for last year's report, but came too late. *See Appendix.*

The amount of Atlantic salmon spawn due the State this year, is about 338,000.

*To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts.*

After my report to you of Dec. 4, 1882, there were received at the hatchery from Bucksport, Me., in January, 315,000 Penobscot salmon eggs; 100,000 of them were given by Prof. Baird to

New Hampshire. These, with the eggs taken at the hatchery from the salmon that came up the Merrimac, making over 400,000, were hatched with a loss of less than two per cent., and were planted in the Pemigewasset River in June. Sixty thousand of them were carried twenty miles up the river and the remainder were planted at various points from two to ten miles above the falls. The young fry were very strong and healthy and as the water had become warm enough to furnish food, good results may be expected from them.

The severe drought seriously interfered with the run of salmon this year, making three years in succession of unusually low water.

The spring run was late and the low water prevented the fall run from reaching here. Many salmon passed the fishway at Manchester in October and must have spawned in the river below here.

The salmon taken here this season were much larger than last year, showing that we have not yet received any return from the plant of 1880.

From one fish, forty inches in length, 15,000 eggs were taken.

The young salmon (parr and smolts) were very plenty in the river this season, and we must soon have a large increase of adult fish from the heavy plant of the last three years, of over 400,000 each year.

There are now in the hatchery 230,000 eggs of the brook trout, and, when all taken, there will be about 250,000, of which one-half will be sent you as soon as sufficiently developed.

I have added over 2,000 trout this summer and shall add 3,000 next year as there are not enough breeders to supply the demand for young trout.

I have taken a few eggs from the Sälbling or German trout, the first ever taken in this country, and have also crossed 2,000 trout eggs with the Sälbling.

The large trout-pond has been planked around the edge, and two tanks, each eight by twenty-five feet, have been built for the accommodation of the brook trout added this year. It will be necessary to still further increase the room for trout another season, which can be cheaply done by building a new pond above the present one large enough to hold three or four thousand small trout.

The new supply of water added to the hatchery last year, being four degrees colder than that from the old spring, retarded, as was anticipated, the hatching of the young fish from fifteen to twenty days and the young fry were very strong and healthy.

E. B. HODGE, *Superintendent.*

PLYMOUTH, N.H., November 26, 1883.

GERMAN CARP (*Cyprinus carpio*).

In former reports attention has been called to the importance of these fish and the opportunities found on almost every farm for cultivating them; also a description of the kind of pond best adapted to their wants, which is here repeated:—

Carp ponds should be flowed loam or grass land, the deepest part running through the centre, sloping to the outlet, where it need not be over five or six feet deep. The rest of the pond should be shallow. This would enable the cultivator to control the water, and by drawing it off slowly bring all his fish into a small compass. Very little more water is needed than will supply the evaporation. When streams are dammed for the purpose of making ponds, the overflow may be taken around the pond and the supply from an inlet at the upper end or side. The fish may be fed on all kinds of vegetables. Where the pond is large they will obtain a large part of their food from the pond. It is a question of pasturage and feed as to the number kept in a pond of a given size. As their food is inexpensive, being easily obtained on any farm, the keeping of large numbers in a small place may be often desirable. Water-snakes, frogs, and every kind of fish that prey upon other fish should be kept out of the breeding pond, or any other place where the young carp are kept.

Notwithstanding this description and the oft-repeated statements published elsewhere, constant applications are being made for these fish to be placed in large ponds containing all kinds of carnivorous fish, where nothing but utter destruction awaits them.

Such applicants have no just cause to complain if their requests are not complied with. The delivery of the carp is on condition that the persons applying have suitable places for them.

No farmer would be so unreasonable as to put his chickens among hawks; neither would any man, if he stops to reflect a moment, be so foolish as to turn young carp into water swarming with their enemies ready to devour them as soon as they strike the water.

Arrangements have been made to deliver the fish free, at the State hatching-house, Winchester, the only charge being



twenty-five cents for a pail to transport them in, when parties do not provide for that part of the work. A tin pail holding about a gallon is all that is necessary to carry from twenty-five to fifty fish. When parties cannot come for them they can be sent by express.

On the 9th of November, through the kindness of Prof. Baird, U. S. Commissioner, four thousand of these fish were received at Winchester, and although they were on the road four days they came in excellent condition, with a loss of only thirteen fish. Nearly half of these have been distributed. Application for carp should be made in the fall, or, in other words, this is the best time to deliver them. With the present arrangement there appears to be no reason why the supply will not be adequate to the demand.

From their prolific character and rapid growth, it would naturally be supposed that the edible qualities of the carp were not of the highest grade. It is fortunate that we do not all think alike, and that our likes and dislikes are sufficiently varied to enable us to utilize, in some form, all the good things with which nature has so bountifully provided us.

In the Appendix will be found an extract from the U. S. Report on Fisheries containing the statements of two hundred and forty-two persons who have eaten carp. To these varied opinions those who desire information upon that point are respectfully referred.

#### REPORT OF THE FISHERIES ON THE MERRIMAC BELOW DEER ISLAND.

For the season ending Sept. 1, 1883, there have been about three thousand two hundred and fifty (3,250) barrels of bait, mostly menhaden, taken by the fishermen of Newburyport this season. Of this amount about three hundred barrels were what is known here as blue-backs. Among these blue-backs taken during the months of July and August, I noticed, in looking over the catch, quite a number of shad one and two years old. From observations made at the shad-hatching establishment at North Andover during the past season, I am satisfied that what the fishermen call sea-shad, which they claim do not run above brackish water, are no other than the white or true shad of the river.

Shad taken at North Andover in July, and submitted without ex-

planation to a number of the fishermen, were decided by them, without hesitation, to be sea-shad. It would be easy to settle this question with these fishermen by giving them the same opportunity that I had last summer. On June 20 and 21, there were excited reports of great shoals of sea-shad in the river, and, at the request of the fishermen, the mayor telegraphed to your Board for permits in accordance with an Act passed by the last legislature.

That there was no apparent foundation for these reports was evident from the investigation made by Mr. Jeffers of Haverhill and myself, a statement of which is herewith submitted : —

JUNE 25, 1883.

TO E. A. BRACKETT, *Chairman of the Board of Commissioners on Inland Fisheries :*

DEAR SIR, — Agreeable to your request, we went to Newburyport on the 22d inst., and presented your letter to the mayor, Mr. Johnson.

He received us very agreeably, and seemed much pleased with the contents of the letter. He saw some of the fishermen that night. We went the next morning (23d) to the fishing grounds quite early and saw all the hauls the fishermen made with their nets, with *not one shad of any kind appearing*. There were only two kinds of fish — *blue-backs* and *pogies*. The fishermen agreed in saying that while there was so much freshet in the river there would not be shad there. On the 25th we chartered a sailboat and went to the fishing grounds, but found no one fishing. Returned and examined the bait caught Sunday. We found several so-called sea-shad among the pogies. The seiners threw them into the water with rather unpleasant indifference to us.

Very truly yours,

WM. JEFFERS,  
EDWIN F. HUNT.

A reference to the report on shad-hatching at North Andover, part of the time under my charge, will show that shad were taken freely on the 22d, 23d, and 25th of June, notwithstanding the high water.

In August parties from Rockport came to Newburyport and caught two hundred barrels of menhaden, one hundred and fifty of which were used for salt bait, and the balance sold fresh. They used gill-nets, as to the legality of which I was in doubt, and before I had settled the question in my own mind they had taken up their nets and were gone.

In my last report I called attention to the injury being done with small mesh seines. I have seen no reason to change my opinion. On the contrary, I am more than ever convinced that if the fisheries of the Merrimac are to be maintained, the use of small mesh seines should be discontinued.

The fishermen of Newburyport have privileges which no others on the river have.

They should then be willing to compromise when the general interest is affected, otherwise, as the public becomes enlightened upon the importance of fish culture, they may lose the confidence of those to whom they now look for support.

EDWIN F. HUNT.

#### PONDS AND STREAMS.

As far as can be judged from the imperfect returns from the inland waters, there has been a decided gain over previous years.

The partial failures can be easily accounted for. It is with water as with land, — some ponds, as some farms, are naturally better adapted to the production of large crops than others. The lack of success in culture is largely due to want of skill and intelligent management. Not at our bidding, not into our out-stretched hands does nature drop her treasures. She yields only to patient, well-directed labor. The want of this is felt in almost every department of fish culture. It is apparent in the common practice of many towns of selling, annually, at auction, their interest in the alewife fisheries to parties whose sole object is to take all they can, regardless of the future. No one would apply this principle to farming.

Were it not for the wonderfully prolific nature of the alewife they would all have been destroyed long ago. As it takes three years from the time they are hatched to return mature fish, the evil of overfishing is not apparent until long after the mistake is made.

It is difficult to understand why intelligent people, who know the habits of these fish, should continue this practice,

There is not a stream in the State where these fish are found that could not, with a little care and labor, be made to produce tenfold its present yield. It is a question whether it would not be a wise policy for the State to compel the opening of all rivers and streams to the cultivation of alewives and maintain them at a high standard. There is no other way in which it is possible to produce so large an amount of food at so little expense. They are also used as bait, and

form no small item in the outfit of vessels engaged in the sea-fisheries, while the influence they would have in restoring our inshore fisheries is too important to be overlooked. Prof. Baird thus speaks of them : —

“The value of the alewife is not fully appreciated in our country. It is, in many respects, superior to the sea-herring as an article of food ; is, if anything, more valuable for export, and can be captured with vastly less trouble, and under circumstances and at a season much more convenient, for most persons engaged in the fisheries.”

Of the ponds leased by the towns, up to the present time, not more than half the returns have been received. The law requires that lessees shall make annual returns of the number and estimated weight of fish caught. The leasing of ponds is for the purpose of ascertaining, as far as possible, their value, and it must be evident that unless returns are made no just estimate can be given.

In France the return is about four dollars per acre, and there is no reason why, with a little experience, we should not exceed that.

There are 196,342 acres of land covered with water in this State which, at the same rent, would make annual returns of over seven hundred thousand dollars. Some of our ponds have done even better.

The difficulty which some of the towns experience in managing the ponds is largely due to rotation in office.

To make the matter a success two or three good men who feel an interest in such matters, should be appointed to take charge of the pond during the term of lease. Several towns have adopted this plan with good results.

Some of the lessees appear to have no idea that they are required to do anything beyond the mere fact of obtaining the lease. This is shown by the following return made by the chairman of selectmen of one of the towns : —

“I do not know much about it, but I guess it has been pretty good fishing. I live on the road to the pond, and have seen several persons go by with large strings of fish.”

As most of the permits issued by the lessees, for fishing, are returnable on the first of December, it is not easy to obtain the results in time for the report for the current year. The town of Stockbridge issued three hundred and fifty permits last spring, and of this number only sixty have been returned up to the present time. These returns indicate a catch of something over six thousand, of which about three thousand were black bass.

The Pittsfield pond which, two years ago, gave a catch of 23,579 fish, has not been heard from this year.

Of the fresh-water fish, such as black bass, white perch, pickerel, etc., six leased ponds have returned for this year, an aggregate catch of 63,305, the average weight per fish being about one pound.

#### RETURNS OF WEIRS, SEINES AND GILL-NETS.

Compared with those of 1882, the returns of the past season show a decrease of 22 in the number of fisheries reporting. Eighty-seven pounds and weirs, 24 sea-seines, 88 gill-nets, and 40 fresh-water seines, are represented in the tables; giving a decrease of sea-seines (9), gill-nets (12) and fresh-water seines (3), and an increase of weirs (2).

While efforts have been made by the Commissioners to supply with blanks and send notifications to all fishermen required to make returns, yet the tables show an entire absence of returns from certain localities where, undoubtedly, fisheries were carried on.

The law of 1876 requires all owners of pounds, weirs and other fixed contrivances, as well as of seines and gill-nets, to apply to the Commissioners for suitable blanks on which to make out their returns. The failure to comply with this law is due in most instances, probably, to ignorance of the law and its object.

Valuable statistics upon this important source of food supply are of such vital importance to the State that it is to be hoped that in future a more extended interest will be taken, and a more united effort made by the fishermen, upon whom the State relies for this information.

In this connection it is gratifying to acknowledge the receipt, during the year, of numerous letters which show that

there is a large class of intelligent fishermen who are willing to do all in their power to provide the proper statistics, realizing the importance of such statistics to their own interests as well as to the business of the State.

It will be seen by Table VIII., that there has been a large falling off in the total catch of shad. The Taunton and Merrimac river fisheries return less than half the number of shad caught in 1882. The catch of shad in the Connecticut River is small, although slightly larger than that of 1882. Complaints of obstructions in Connecticut waters have been received from our Connecticut River fishermen.

More salmon than usual were seen to pass up the Merrimac River last spring. The returns show a falling off in the catch of sea-herring, alewives, Spanish-mackerel, blue-fish, striped-bass, scup and tautog, and a large increase in the catch of menhaden, showing that this fish is again becoming abundant on our coast. There is also a gain in the catch of mackerel, squeteague, flat-fish and eels.

The following communication was received after the copy for this report had been sent to printers, but as the suggestions made require the most careful consideration it is deemed advisable to insert the paper here in order to draw attention to the subject. That the laws in relation to weirs are defective there seems to be no doubt:—

PROVINCETOWN, Dec. 13, 1883.

*To the Board of Inland Fisheries:*

GENTLEMEN, — During the last few years the fish weir, or, more correctly, the catching of fish by means of fish weirs, has assumed an importance which could not and was not foreseen when the present law was enacted, and owing to the rapid growth of this industry many complications arise every year, which the present law seems wholly inadequate to meet, and some of its provisions are so vague that it is causing many altercations and disagreements between the land owners and the selectmen. For instance, the clause “provided such weirs cause no obstruction to navigation and do not encroach upon the rights of other persons.” I can find no law that clearly defines what the rights of land owners bordering upon tide waters are. The law in regard to riparian ownership does not seem to wholly cover the ground, as by that law they would seem to have no right below 100 rods, provided the tide ebbed that far, whereas section 13, chapter 19 of the Public Statutes would indi-

cate that they have rights to the harbor line. Take, for instance, the action of some of the selectmen. They have granted a large part of the shore privilege for putting down weirs to *one man, wholly debarring three-quarters of the land owners from any privilege whatever*, claiming they have the right so to do, because in constructing these weirs part of the structure was built below low-water mark, notwithstanding section 13 says the owners of the land or flats shall have "equal proportional privileges." In my opinion the whole matter should be taken from the hands of selectmen, and placed under the jurisdiction of the "Commissioners of Inland Fisheries," where local affairs and influence cannot be brought to bear, and where selectmen cannot secure any more than their proportional privileges, as was the case in a matter brought to the attention of the "Committee on the Fisheries" during last session, in which it was proven that the selectmen had secured one-half the privileges for themselves. The obstruction to navigation clause also needs defining. I think it would be a very good plan to have what might be designated a fish-weir line described, beyond which no weirs should be constructed, and also defining the rights of riparian owners inside of said line, so as to obviate all future trouble. This matter has been brought to the attention of the Harbor and Land Commissioners, and if your honorable body should deem it advisable, I respectfully ask that mention be made in regard to this matter in your forthcoming annual report, making such suggestions as you may think proper.

I have the honor to most respectfully submit the foregoing to the consideration of your honorable board.

Respectfully,

E. E. SMALL.

#### FISHERIES ON THE LOWER MERRIMAC.

No inconsiderable portion of the time of the fish committee of the legislature, during the last two sessions, was taken up by the claims put forth by the fishermen of Newburyport for the privilege of taking *sea-shad* at the mouth of the Merrimac. Beyond the assertion that these fish never enter fresh water there was no evidence produced at the hearings that they differed materially from the true shad. The existence of a new species of shad on our coast was not probable, for all authorities now agree in there being only one species, the *Alosa sapidissima* (Syn. *Alosa præstabilis*, De Key). Jordan refers the shad to the genus *Clupea* and calls the fish

*Clupea sapidissima*. It is thought that the shad from the different rivers can be designated ; but only as slight local varieties, not as species.

The following are our Clupeoids as given by Jordan, in his synopsis, 1883 :—

- Clupea harengus*. Common herring, “whitebait” (young).
- “ *mediocris*. Hickory shad, tailor herring, fall herring.
- “ *vernalis*. Alewife.
- “ *æstivalis*. Blue-back, glut herring.
- “ *sapidissima*. Shad.

*The Hickory Shad.*

*Clupea mediocris*, Mitchell.

“ *mattowacca*, “  
*Alosa lineata*, Storer.

*Pomolobus mediocris*, Gill.

“ “ Goode & Beans’ list, 1879.

This fish extends along the coast from Newfoundland to Florida. We can find no statements of its going into fresh water. (There is, however, another fish which has the same common name—hickory-shad or gizzard-shad—found in the Ohio and other western rivers ; but this fish belongs to the genus *Dorosoma*.)

Capt. Atwood, in answer to an inquiry, says :—

“I am not aware that the hickory shad ever go in fresh water, —they visit us annually in small numbers, and are only taken occasionally in nets when fishing for other fish.”

This is the only fish that can with any propriety be called *sea-shad*, as, according to the best information we can obtain, it lives and spawns in the sea and does not, to any extent, run into the rivers of this State. As an edible fish it is not desirable and is so distinct from the common shad that no one could mistake one for the other. This certainly cannot be the shad that the fishermen of Newburyport desire to catch, for it is worthless as food, and furthermore, there is no evidence that they ever enter the Merrimac.

What, then, could have been their object in pressing for the privilege of taking shad at times prohibited by law through-



out the State. There can be no doubt that there has been at long intervals a phenomenal movement of shad along our coast. Capt. N. E. Atwood, than whom there is no better authority, thus speaks of it:—

About 1840 there appeared on our coast, south of Cape Cod, large quantities of shad, which appeared to be the same species with those that visit the Connecticut and Merrimac Rivers annually (*Alosa prestabilis*). Fishermen from Massachusetts, Connecticut and Rhode Island engaged in the fishery and found it profitable. In 1842 an Act was passed by the legislature to prohibit fishermen from other States, from fishing for shad within a line drawn from Monomoy Point to Point Gammon. I myself engaged in this fishery, but we found there was no need of the passage of such an act. The shad appeared in small numbers, so that not enough were caught to pay expenses. They were also caught in large quantities in the waters north of Cape Cod. They then disappeared, so that only a few straggling specimens have since been caught in these localities. Where were they before they appeared in our waters? What was the cause of their coming? Where are they now? All that can be said in answer, I can say in three words,—they are gone.”

They came suddenly upon the coast, entering the bays and mouths of rivers, remaining but a few days in a place, and then disappeared. It is difficult to form a definite idea of the extent of this school of fish. They are said to have come in vast shoals. It was stated by one man who watched them carefully that the shore was lined with them as far as the eye could reach, and if fishermen had been prepared for them they could have made a fortune.

Fish stories are luxuriant in their growth, often assuming proportions that rival the tales of Arabian Nights. It is, however, certain that these shad were caught in some places in considerable numbers. So far as we know, this unusual movement of shad has occurred but once since 1840. That they were fish that had spawned in more southern waters, and, from some unknown cause, were moving along our coast, is probable.

For the purpose of enabling the fishermen to take advantage of such an influx, should it ever occur again, the legislature has authorized the Commissioners, at their discretion,

to grant permits. These permits were not intended to cover the ordinary fishing of the rivers.

Very little is known of the habits of migratory fish after they leave fresh water. While we have conceded that it is possible that these shad belong to other rivers, there are certain facts which make it more than probable that during the late summer and autumn migratory fish do not, as a rule, go far from the mouths of rivers to which they belong, and that they frequently enter them on the incoming tide and return with the ebb. As shad run in schools it is not unlikely that they remain in the bays and estuaries until the young come down in the autumn and both old and young move together to their winter grounds. Salmon that spawn at the headwaters of our rivers in the fall do not return to the sea until the next spring, and the smolts or young salmon go down at the same time.

Previous to the restocking of the Merrimac with salmon they were seldom taken by the weirs on either side of the Cape, but since then a great many have been caught in weirs and gill-nets. In fact it may be said that many weirs are deriving considerable benefit from the restocking of the river. One weir is reported to have caught, in one season, over twenty salmon. The salmon is naturally a very hardy fish and quite tenacious of life, yet by some strange fatality they always die when they get into the weirs.

Shad, one, two and three years old can be taken at North Andover until the 20th of July, and are found more or less abundant on the lower part of the river throughout the whole season. The taking of these fish and the using of small mesh seines which destroy the young shad that go down in October and November is a serious, if not fatal, injury to the fisheries of the river.

It is entirely in relation to this that conflict has arisen between the fishermen of Newburyport and the State. There is not and cannot be any disposition to deprive them of any reasonable amount of fishing. They should remember that their fishing grounds comprise a very small portion of a large river, which takes its rise in and runs through a large part of another State, and that they have the key to the fisheries of the whole river, which for that reason should be

properly guarded. The laws regulating fisheries are made for the benefit not of the *few* but of *all*.

When the fishermen accept this and live up to it in good faith, there cannot be any conflict between them and the interests that should govern the fisheries of the river in its course through both States.

E. A. BRACKETT.

ASA FRENCH.

F. W. PUTNAM.

## EXPENSE OF COMMISSION.

Salary to Dec. 1, 1883, . . . . .	\$1,650 00	
Travelling and other expenses, . . . . .	126 94	
		<u>\$1,776 94</u>

## GENERAL EXPENSES.

## Hatching Works near Livermore Falls:—

E. B. Hodge, services, . . . . .	\$375 00	
Assistants " . . . . .	86 25	
Repairs, . . . . .	32 82	
Express, . . . . .	15 95	
Rent, . . . . .	50 00	
Tanks, . . . . .	13 00	
Fish meat, . . . . .	13 09	
		<u>586 11</u>
Subscription to fund of Penobscot Salmon Breeding Establishment, . . . . .	502 69	
Thos. S. Holmes, labor and stock, Lawrence Fishway, . . . . .	74 16	
Use of boats, nets and premises at North Andover, . . . . .	50 00	
Robert R. Holmes, services and expenses, . . . . .	117 66	
Edwin F. Hunt, " " . . . . .	394 85	
B. P. Chadwick, " " . . . . .	96 40	
E. S. Robinson, " " . . . . .	31 00	
Robert Elliot, " " . . . . .	60 00	
Wm. Jeffers, " " . . . . .	83 40	
W. F. Brackett, plans and specifications, . . . . .	24 70	
Repairing dam at Middleborough, . . . . .	51 80	
Legal services in the matter of taking Half-way Pond at Plymouth, . . . . .	17 50	
Rent of land, hatching-house at Winchester, . . . . .	50 00	
J. C. Walker, services, . . . . .	18 00	
Expressage, . . . . .	44 85	
Printing, . . . . .	25 10	
Cans for transporting fish, . . . . .	60 00	
Pails for transporting carp, . . . . .	20 00	
Fish net, . . . . .	35 28	
Rope and twine and salt, . . . . .	6 86	
		<u>\$4,127 30</u>

---

---

## APPENDIX.

---

---



[A.]

## LIST OF FISH COMMISSIONERS.

---

### DOMINION OF CANADA.

W. F. Whitcher, Commissioner, . . . Ottawa, Ontario.

### PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, . . St. John.

### PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, . . . Amherst.

### PROVINCE OF PRINCE EDWARD ISLAND.

R. H. Duvar, Inspector, . . . Alberton.

### PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson, . . . . . Victoria.

### THE UNITED STATES.

Prof. Spencer F. Baird, . . . . Washington, D.C.

### ALABAMA.

Col. D. R. Hundley, . . . . . Mooresville.

Hon. C. S. G. Doster, . . . . . Prattville.

### ARIZONA.

Hon. J. J. Gosper, . . . . . Prescott.

Hon. Richard Rule, . . . . . Tombstone.

J. H. Taggart, Business Manager, . . . Yuma.

## ARKANSAS.

John E. Reardon, . . . . .	Little Rock.
James H. Hornibrook, . . . . .	Little Rock.
H. H. Rottaken, . . . . .	Little Rock.

## CALIFORNIA.

J. D. Redding, . . . . .	San Francisco.
A. B. Dibble, . . . . .	Grass Valley.
B. H. Buckingham, . . . . .	Washington.

## COLORADO.

Wilson E. Sisty, . . . . .	Idaho Springs.
----------------------------	----------------

## CONNECTICUT.

Dr. W. M. Hudson, . . . . .	Hartford.
Robert G. Pike, . . . . .	Middletown.
G. N. Woodruff, . . . . .	Sherman.

## DELAWARE.

Enoch Moore, Jr., . . . . .	Wilmington.
-----------------------------	-------------

## GEORGIA.

Hon. J. T. Henderson, Commissioner of  
 Agriculture, . . . . . Atlanta.  
 Dr. H. H. Cary, Superintendent of Fisheries.  
 Under the laws of the State these two constitute the Board of Fish  
 Commissioners.

## ILLINOIS.

N. K. Fairbank, President, . . . . .	Chicago.
S. P. Bartlett, . . . . .	Quincy.
S. P. McDole, . . . . .	Aurora.

## INDIANA.

Calvin Fletcher, . . . . .	Spencer, Owen County.
----------------------------	-----------------------

## IOWA.

B. F. Shaw, . . . . .	Anamosa.
A. A. Mosher, . . . . .	Spirit Lake.



## KANSAS.

W. S. Gile, . . . . . Venango.

## KENTUCKY.

Wm. Griffith, President, . . . . . Louisville.  
 P. H. Darby, . . . . . Princeton.  
 John B. Walker, . . . . . Madisonville.  
 Hon. C. J. Walton, . . . . . Munfordville.  
 Hon. John A. Steele, . . . . . Versailles.  
 W. C. Price, . . . . . Danville.  
 Dr. W. Van Antwerp, . . . . . Mt. Sterling.  
 Hon. J. M. Chambers, . . . . . Independence, Kenton County.  
 A. H. Goble, . . . . . Catlettsburg.  
 J. H. Mallory, . . . . . Bowling Green.

## MAINE.

E. M. Stilwell, . . . . . Bangor.  
 Henry O. Stanley, . . . . . Dixfield.

## MARYLAND.

Thomas Hughlett, . . . . . Easton.  
 G. W. Delawder, . . . . . Oakland.

## MASSACHUSETTS.

E. A. Brackett, . . . . . Winchester.  
 Asa French, . . . . . South Braintree.  
 F. W. Putnam, . . . . . Cambridge.

## MICHIGAN.

J. C. Parker, President, . . . . . Grand Rapids.  
 A. J. Kellogg, . . . . . Detroit.  
 John H. Bissell, . . . . . Detroit.

## MINNESOTA.

1st District—Daniel Cameron, . . . . . La Crescent.  
 2d District—Wm. M. Sweney, M. D., . . . . . Red Wing.  
 3d District—Robert Ormsby Sweney, Presi-  
                   dent, . . . . . St. Paul.

## MISSOURI.

John Reid, . . . . . Lexington.  
 J. G. W. Steedman, Chairman, . . . 2803 Pine Street, St. Louis.  
 J. S. Logan, . . . . . St. Joseph.

## NEBRASKA.

R. R. Livingston, . . . . . Plattsmouth.  
 William L. May, . . . . . Fremont  
 B. E. B. Kennedy, . . . . . Omaha.

## NEVADA.

Hon. Hubb G. Parker, . . . . . Carson City.

## NEW HAMPSHIRE.

Geo. W. Riddle, . . . . . Manchester.  
 Luther Hayes, . . . . . South Milton.  
 Elliott B. Hodge, . . . . . Plymouth.

## NEW JERSEY.

Theodore Morford, President, . . . . . Newton.  
 Richard S. Jenkins, . . . . . Camden.  
 William Wright, . . . . . Newark.

## NEW YORK.

Hon. R. Barnwell Roosevelt, President, 76  
 Chambers Street, . . . . . New York.  
 Gen. Richard U. Sherman, Secretary, New  
 Hartford, . . . . . Oneida County.  
 Edward M. Smith, . . . . . Rochester.  
 Eugene G. Blackford, . . . 809 Bedford Avenue, Brooklyn.

## NORTH CAROLINA.

S. G. Worth, . . . . . Raleigh.

## OHIO.

Col. L. A. Harris, President, . . . . . Cincinnati.  
 Chas. W. Bond, Treasurer, . . . . . Toledo.  
 Halsey C. Post, Secretary, . . . . . Sandusky.

## PENNSYLVANIA.

Hon. B. L. Hewit,	.	.	.	.	.	Holidaysburg.
James Duffy,	.	.	.	.	.	Marietta.
John Hummel,	.	.	.	.	.	Selin's Grove.
G. M. Miller,	.	.	.	.	.	Wilkesharre.
John Gay,	.	.	.	.	.	Greensburg.
Arthur Maginnis,	.	.	.	.	.	Swiftwater.

## RHODE ISLAND.

John H. Barden,	.	.	.	.	.	Rockland.
Henry I. Root,	.	.	.	.	.	Providence.
Col. Amos Sherman,	.	.	.	.	.	Woonsocket.

## SOUTH CAROLINA.

Hon. A. P. Butler, Commissioner of Agriculture,	.	.	.	.	.	Columbia.
C. J. Huske, Superintendent of Fisheries,	.	.	.	.	.	Columbia.
These two officers constitute the Fishery Commission.						

## TENNESSEE.

W. W. McDowell,	.	.	.	.	.	Memphis.
H. H. Sneed,	.	.	.	.	.	Chattanooga.
Edward D. Hicks,	.	.	.	.	.	Nashville.

## TEXAS.

John B. Lubbock,	.	.	.	.	.	Austin.
------------------	---	---	---	---	---	---------

## VERMONT.

Hiram A. Cutting,	.	.	.	.	.	Lunenburg.
Herbert Brainerd,	.	.	.	.	.	St. Albans.

## VIRGINIA.

Col. Marshall McDonald,	.	.	.	.	.	Berryville.
-------------------------	---	---	---	---	---	-------------

## WEST VIRGINIA.

H. B. Miller, President,	.	.	.	.	.	Wheeling
C. S. White, Secretary,	.	.	.	.	.	Romney.
N. M. Lowry,	.	.	.	.	.	Hinton.

## WISCONSIN.

The Governor, *ex officio*.

Philo Dunning, President,	. . . . .	Madison.
C. L. Valentine, Secretary and Treasurer,	. . . . .	Janesville.
J. V. Jones,	. . . . .	Oshkosh.
J. F. Antisdel,	. . . . .	Milwaukee.
Mark Douglas,	. . . . .	Melrose.
C. Hutchinson,	. . . . .	Beetown.

## WYOMING TERRITORY.

Dr. M. C. Barkwell, Chairman,	. . . . .	Cheyenne.
Otto Gramm, Secretary,	. . . . .	Laramie.
N. L. Andrews,	. . . . .	Johnson County.
E. W. Bennett,	. . . . .	Carbon County.
P. J. Downs,	. . . . .	Uinta County.
T. W. Quinn,	. . . . .	Sweetwater Co.

## WASHINGTON TERRITORY.

Albert B. Stream,	. . . . .	North Cove.
-------------------	-----------	-------------

[B.]

## SALMON BREEDING ESTABLISHMENT IN MAINE.

---

BUCKSPORT, MAINE, December 30, 1882.

*To the Commissioners on Inland Fisheries, Commonwealth of Massachusetts.*

GENTLEMEN:—In response to your request for a sketch of the condition of the Penobscot and Schoodic salmon-breeding establishments, and of the work of collecting spawn, I beg leave to submit the following:—

### 1. THE PENOBSCOT ESTABLISHMENT.

Here we are concerned only with the large migratory salmon, the natural inhabitants of all the rivers of eastern North America, north of the Hudson. The Penobscot River enjoys the distinction of being the only river in the United States whose fisheries of this species are sufficiently productive to warrant an attempt to collect its spawn on a large scale. For the past twenty years, the yield of the river, though far smaller than in early times or even than forty years ago, has varied from 5,000 to 15,000 salmon annually, the average being much nearer the lower figure.

The natural breeding ground of these salmon is in the wild country at the headwaters in all the gravelly tributary streams, where they are to be found digging their nests on the shallow rapids in October and November. The difficulties attendant on catching the salmon and securing their spawn at that inclement season of the year, in a wilderness where the fish are scattered far and wide and where no established fisheries exist, led to the organization of an establishment near the mouth of the river, where the salmon can be taken in large numbers as they are passing upward in May and June, and impounded until the breeding season arrives. There was, in the beginning, some doubt whether in confinement the reproductive functions of the fish would act normally; but the first experiment yielded favorable results, and with the proper arrangement of details the operations are attended with complete success.

The supply of the adult salmon is obtained from a few of the numerous fish weirs built every year about the mouth of the Penobscot. The fishermen who own them are furnished proper dipping gear and with cars in which to transport the fish to headquarters. These cars are made out of common dories, by providing them with grated openings, fore and aft, and a cover of netting. About low water, when the salmon are mostly taken from the weirs, they are brought together at a central point in the fishing district, counted, adjudged as to weight, replaced in the cars, ten to fifteen in each, and despatched to the enclosures, which are located in a fresh-water stream called "Dead Brook," a tributary of Eastern River, which in turn joins the Penobscot at its very mouth. The total distance from the collecting station at the south end of Verona to the enclosure is not far from seven miles, and the transfer is made without any other delay than that attendant on the passage through a lock at Orland.

The enclosure is simply an ample portion of the brook (about one hundred rods), fenced off securely, above and below, by grated barriers. The width of the brook is two to four rods, the current gentle to sluggish, the bottom in part gravelly but in greater part muddy, the water clear and never failing, the depth from five to ten feet. It appears to be admirably adapted to our purpose.

At the upper end of the enclosure are located the fixtures for recapturing and manipulating the fish. By the end of October they are nearly all ready to yield their spawn and milt. The methods employed do not differ much from those generally in use. The milt is applied to the eggs before they are put into water and the rate of impregnation is high. It rarely happens at this establishment that a female salmon yields any imperfect eggs, so far as the eye can distinguish,—something I should be glad to say also of the Schoodic salmon.

The hatching-house is located on the east shore of Alamoosook Lake, two miles from the salmon enclosure,—an inconvenient feature, but unavoidable, as no good site could be obtained nearer. But the task of transferring the eggs is not very great and in all other respects the facilities for developing and hatching the eggs are unsurpassed in my observation. A crystal brook supplied by one of the purest of lakelets, "Craig's Pond" by name, and reinforced by numerous springs, comes tumbling down over a rocky bed to the hatching-house. There is practically no limit to the supply of water, and nothing lacking as to aeration. We were troubled at first by the warmth of the spring-water, which hastened the development of the spawn unduly, and compelled us to send part of it away early in December; but an aqueduct 1,500 feet in length,

taking its supply from the brook above the springs, now brings us a supply of cold brook-water, so that we have a choice between cold and warm, and can delay the shipment of spawn to a convenient date.

The work of the present season may be summed up in a few words. There were purchased 587 salmon. The losses from sundry causes, known and unknown, foot up 147. The remaining 440 were recaptured in the fall and found to embrace 184 males, 256 females. A little more than 2,000,000 of eggs were secured, of which the most forward are at this date about ready for shipment. The three hundred dollars contributed by Massachusetts will entitle her to about 220,000 eggs.

## 2. SCHOODIC ESTABLISHMENT.

The Schoodic salmon belong to the group of "land-locked salmon." They pass their whole lives in fresh-water, the lakes being their main abode, the streams being resorted to occasionally for feeding, but mainly for breeding purposes. There are four river systems in the State of Maine that contain these "land-locked" salmon; namely, the Penobscot, the Piscataquis (a branch of the Penobscot), Union River and the St. Croix. They are most abundant in Grand Lake and its outlet, Grand Lake stream, in the Schoodic system, on the west branch of the St. Croix. Grand Lake stream is their main breeding ground, and thither they resort in thousands every autumn, a little later than the spawning time of the Penobscot salmon.

It being the habit of these salmon to feed during all the summer and early autumn, it would not answer to enclose them in June as we do the Penobscot fish. The securing of a stock of breeding fish must be therefore deferred until the near approach of the spawning season, generally until the most forward of the fish have actually begun to spawn, which occurs the last week in October. By Nov. 20 or 25, the fish are generally all manipulated and returned to the lake. The capture is much facilitated by the fact that the main body of the fish are moving down from the lake into the stream. A series of enclosures spanning the entire width of the stream, constructed of fine-meshed nets, planned on the principle of a river fish-weir, intercepts and secures almost the entire school of fish.

The Schoodic salmon are pigmies compared with the Penobscot salmon and inferior to their brethren of Lake Sebago and Union River, but yet are quite respectable in size for a fresh-water fish. For several years there has been a marked increase in the average size of those taken at Grand Lake stream, and it is now not far

from two and one-half pounds, specimens weighing between three and four pounds being common, and those of five and six pounds occur now and then. This year the condition of the fish has been the best and they have yielded the smallest proportion of defective eggs that I have ever known at Grand Lake stream. A curious fact is that the normal size of these eggs is decidedly greater than that of the migratory, sea-going salmon, though the disparity in size is quite the reverse.

The location of a developing and hatching house at this station has given us much trouble, there being no available site that combined all the desiderata in a fair degree. We have now three houses for the purpose. The principal one is located near the lake shore, a few hundred feet above the dam that commands its outlet and very near to the fishing ground. The house is supplied with spring-water only, but being located on a hillside the facilities for aeration and repeated use of the water are excellent, and there is always an abundance of water for hatching out the twenty-five per cent. reserve which has been established, at first by custom and later by law, as the proportion to be returned to the lake to avoid exhausting the supply; and with an additional aqueduct, which appears feasible, I think the entire stock of eggs (if not over 2,000,000) could be carried through the whole winter safely. This house covers about 1,500 square feet of ground, is well-built and very convenient. Near it are a cottage for the superintendent, a lodge for the foreman, an ice-house and woodsheds. The second hatching-house is by the side of the stream, about a quarter mile distant from the first, supplied with cold lake-water. This is used every winter until March. The third house is back in the woods half a mile from the stream and supplied with spring-water only. It is used only in emergency.

The present season we have taken about 1,600,000 eggs. The subscription of Massachusetts, five hundred dollars, will entitle her to about 175,000 eggs.

Very respectfully submitted.

CHAS. G. ATKINS.



[C.]

## SALMO SALAR.

So much has been said and written about salmon and salmon-fishing that it seems almost useless to attempt to say anything more on the subject; but as some of the readers of fishery reports may have never had their attention called to the subject, a brief mention of some of the characteristics of the fish may not be out of place.

From time immemorial the salmon has been considered the king of fishes. His habits, his beauty of form and proportion all indicate his superior breeding.

The true *Salmo salar*, so far as known, is found only in the rivers flowing into the Atlantic Ocean north of forty degrees of north latitude, principally those of Norway, Great Britain and the east coast of North America.

In former years nearly all the rivers of New England were abundantly stocked with this valuable fish, and it is to be deplored that with the march of civilization, which has been blind to the importance and value of fresh-water fish as an article of food, they have been almost entirely exterminated.

Hendrik Hudson, when he discovered the beautiful river which bears his name, reported "seeing stores of salmon leaping from its waters." The last fish seen there was killed at Troy in 1840. How long since they disappeared from the Connecticut I am unable to say; but it was many years ago. The Merrimac contained a few fish within my own recollection. The building of the dam at Lawrence, however, proved their death-knell for a number of years; but thanks to the perseverance and energy of our Fish Commissioners it is again well stocked with salmon. There are none in the Saco or Androscoggin, and only a few in the Kennebec, which in former years furnished a large proportion of the salmon sold in our markets.

The Penobscot is the only river of importance which has not long ago been closed to their passage. Formerly it was one of the

most prolific rivers of which we have any knowledge, and under proper restrictions could no doubt be restored to its former condition. Until last year net-fishing was not prohibited in any of the rivers in the State of Maine; and it is a well-known fact that there were taken, a few seasons ago, from one pool, near what is known as Hunt's farm, on the east branch of the Penobscot, 684 full-grown salmon. The effect of such wholesale slaughter of *parent fish* is sad to contemplate. The law recently enacted provides that no salmon shall be taken above *tide-water* in any manner except with single baited hook and line, or artificial fly.

Salmon, together with all other migratory fish, always return to the river in which they are bred, *and to no other*. As it requires a dam of only about ten feet in height to effectually bar them out, the importance of erecting proper fishways over all dams can scarcely be over-estimated.

They enter the fresh-water streams at times varying somewhat according to locality. In many of the rivers of Great Britain, fly-fishing begins as early as the middle of March; in the Provinces of Quebec and New Brunswick, not till the middle or last of June; at which time the heaviest run of fish takes place, lasting usually till the middle or last of July, after which time only a few stragglers are seen entering the fresh water.

A large proportion cast their spawn during the month of October and a few as late as the middle or even the last of November. It is a well-known fact that they take no food of any kind whilst in the fresh water, and, as a natural consequence, the longer they remain the poorer they become. Their silvery coat-of-mail is gradually changed to one of a dull blackish copper color, and the beautiful fish which left the sea in June or July, becomes in September an object of disgust, neither pleasing to the eye or fit for food.

All authorities admit that salmon cast nearly a thousand ova for every pound of their weight. Such being the case, one would very naturally infer that any fish furnishing so large a number of eggs would very soon over-stock an ordinary river. So they would had they not so many enemies. The sea-trout, which abounds in all Canadian salmon rivers, devours not only thousands of ova, but depends mostly upon the small fry of salmon for their daily food. Next comes the sheldrake and king-fisher, who can each stomach at least twenty small fish per day; and last, not least, comes man, who resorts to every possible artifice to destroy them; but of all weapons used, the Indian spear is the most deadly. Fortunately there is a heavy penalty of both fine and imprisonment for using it in Canada, and also, I believe, in Maine and the

other New England States. If there is not there ought to be. In the Dominion of Canada the fishery laws are *obeyed* and have rarely to be *enforced*. Public sentiment is in favor of protecting the fisheries, and there is not annually reported more than a dozen cases of infringement.

It is to be hoped that our own people will soon realize the importance of increasing the fish supply of our inland waters, and lend a helping hand to the efforts of the Commissioners, and thereby enable them, by hearty co-operation, to realize the possibilities of fish culture and do their share towards re-stocking our streams and ponds with valuable food-fishes.

The fish of each separate river have a distinctive individuality, so marked that an expert can always determine by their external appearance what stream they were taken from. The difference is no doubt principally owing to local peculiarities of both food and water. They are keen of sight, detecting the slightest movements, but they are oblivious to sound. They possess to a wonderful degree the sense of smell. This last statement can be easily proved by placing a small quantity of ova in the current of a stream (fastened, of course, so that it will not drift away). In a very short time it will be surrounded with large numbers of small fish, which have come invariably from below, whence the odor of the spawn has been carried by the current.

The instinct of salmon to reach their spawning grounds is one of their strongest characteristics. Heedless of danger, they will press forward, overcoming obstacle after obstacle with an energy and determination which ought to always command success: such, however, is not the case. At one of the falls on the Columbia River, Oregon, many thousands of the Pacific salmon are annually killed in their frantic attempts to leap the fall, by being thrown back upon the jagged rocks at the foot of the rapids. Those that succeed have to travel many hundred miles inland, and reach their destination so weak and emaciated that it is doubtful if, after casting their spawn, they have strength enough left to enable them to reach the sea again.

Of their haunts and habits whilst in the salt water nothing is positively known. Their movements still remain a mystery. The closest observation has thus far failed to determine with any certainty, whether they remain near the shores and around the mouths of rivers, or whether they go far out to sea. The fact that they are never taken on trawls or hand-lines whilst fishing for deep-sea fish, but on the contrary are often taken in stake-nets and weirs, long distances from the mouth of any salmon stream, would certainly tend to prove that they do not venture far from shore.

Localities which they frequent are doubtless determined by the question of food, which consists of all manner of small fish, capelin and sand-eels being a favorite diet.

They are often taken in the estuary of the Penobscot as early as the month of February, by smelt fishermen when drawing their nets under the ice. There are also taken every year in the St. John, near the mouth of Indian River, from fifty to one hundred salmon between the 15th and 30th of November, in first rate condition for the table; plump and fat, the milt and ova in an undeveloped state. These and a few other facts furnish sufficient data upon which to build a theory, and it is to be hoped that more extended research and closer observation may yet solve the mystery, or at least throw more light on the subject.

WALTER M. BRACKETT.

Boston, December 10.

[D.]

## DESCRIPTION OF SALMON PASSES,

*On the river Sire, Norway, by A. LANDMARK, Government Inspector of Fisheries.*

---

The river Sire (pronounced See-ra), which falls into the North Sea about midway between Christiansand and Stavanger, has a total length of about 146 kilometres (90 English miles), and drains about 1,870 square kilometres (722 English square miles). During the greatest floods—that occur, however, only at intervals of many years—the river discharges close upon 41,000 cubic metres of water a minute. The volume when the river is dryest (as a rule in or about the month of March) has not been accurately determined; but to judge from an approximate computation, it can hardly exceed 300 cubic metres a minute. Having for a considerable distance an elevated bed (from 500 to upwards of 1,000 metres above the level of the sea), and flowing, on well-nigh the whole of its course, between lofty and precipitous mountains, the river passes through a number of lakes, the two largest of which are the Lundevand (length 14 English miles, area 10 English square miles) and the Sirdalsvand (length 17 English miles, area 7 English square miles), both situate in comparative proximity to the mouth of the river. Owing to the great length of the catchment-basin, all the tributary streams are comparatively small; the largest of these, the Moi, flows—not to mention several smaller sheets of water—through the Hovevand, a lake of some extent, and, after a course of about 18 English miles, falls into the upper end of the Lundevand. Nearly all the other affluents have an exceedingly rapid fall.

Originally, the Sire was not accessible to salmon for more than a few hundred yards above the estuary, the river at that short distance from its embouchure pouring down in a fall, the Logsfos, 8.5 metres (28 English feet) high, which presents an insurmountable obstacle to the further ascent of salmon. About 1,200 metres

above the Logsfos, there is another and far more obstructive fall, the Rukanfos, with a total perpendicular height of 27.2 metres (89 English feet). From the trifling extent of water previously open, salmon were never particularly abundant in the river, and the yield of the salmon fisheries has always been very inconsiderable compared to the size of the river.

Now, however, the salmon-passes at the Logsfos and the Rukanfos enable the fish to surmount those falls; and thus about 50 miles of lake and river are rendered easily accessible to salmon, the river being now open up to the falls of Lindland, on the main river, and to a short distance above Rusdal, on the Moi. In the above-mentioned lakes, which, throughout the greater part of their extent are remarkably deep, with rocky and precipitous shores, salmon find a safe retreat, where, with comparative facility, they can avoid capture, while the reaches of river above the lakes afford plenty of excellent spawning-beds. Hence, it is quite certain that, the Logsfos and the Rukanfos being now passable, the salmon producing capacities of the river are enormously increased, and, more especially, from the Sire flowing through a tract distinguished, it should seem, by the most favorable conditions for a productive salmon-fishery, the deleterious effects of extremely cold in winter being less severely felt in that region than is the case throughout the greater part of Norway.

The entire extent of the water-course is shown in Plate I\* (scale  $\frac{1}{20000}$ ), the catchment-basin of the Sire being colored red, with black transverse lines indicating the extreme limits of the reaches of the rivers rendered accessible to salmon by the passes.

That part of the river that extends from the Lundevand to the estuary, and between which, as stated above, both the Rukanfos and the Logsfos are situate, is shown on a larger scale ( $\frac{1}{2000}$ ) in Plate II., which also contains a plan of the salmon-passes at the said falls, together with a longitudinal section of the river (the elevations on 10 times as large a scale).

*The pass at the Logsfos* is comparatively simple, consisting as it does in greater part of a channel dug through a natural depression on the left bank of the river, in the layer of stones and gravel, and for which there has been but little need of blasting and masonry. This channel, into which the water flows a couple of hundred yards above the falls, pouring out some few yards below them, in the exact spot where the salmon principally congregate, has a total length of 320 metres (1,050 English feet). Its breadth varies, but is nowhere less than 2.2 metres at the bottom, whence the sides

\* The drawings referred to have not yet been received.

slope upwards, with an incline of 1 in  $1\frac{1}{2}$ . The actual outlet consists of a short conduit, blasted in the solid rock, only 1 metre wide and about 2 metres deep, with well-nigh perpendicular walls; and in order that the whole body of water shall force its way through this narrow passage, a stone wall, 16 metres long and  $2\frac{1}{2}$  metres high, has been erected immediately above the outlet. By this means, the volume of water is discharged from the channel as a rapid and slightly foaming stream, that cannot fail to attract the attention of salmon, though never attaining sufficient force to impede in the slightest degree the passage of the fish. The upper part of the pass has for a considerable distance a gradient of only 1 in 200, which gradually increases, the 70 lowest metres inclining 1 in 15. With so gentle a slope, there is no need of stops, or any other additional appliances, to facilitate the ascent on the greater part of the pass; but where the gradient is 1 in 15, and the channel extends between perpendicular rocks, a series of transverse wooden barriers, placed at a relative distance of 5 metres, serve to break the fall, the top of each barrier lying one-third of a metre lower than that preceding it.

With a view to diminish the excavation in the upper part of the channel, a dam is building across the river, close to the edge of the Logsfos, to secure, when the water is lowest, a depth of water of 0.7 metre, in the upper part of the pass.\* During ordinary summer floods, the water in that part of the pass rises even now to the height of 1 to  $1\frac{1}{2}$  metre, and in heavy floods higher still. Hence the average volume of water at present even is very considerable, viz., with a depth of  $1\frac{1}{2}$  metre, circa 460 cubic metres (about 15,000 English cubic feet) a minute, or more than the whole body of water discharged by the river when lowest. With a view to protect the pass, and preserve it from damage during heavy floods, the proprietors think of erecting at the inlet a flood-proof dam, provided with sluices and with an apparatus for the capture of salmon, principally parent fish, from which to procure spawn for artificial hatching.†

A longitudinal section of the pass is given in Plate IV. As will be seen from the figure, the bottom of the pass at the outlet is very nearly on a level with the surface of the river when lowest, whereas the bottom at the inlet is 0.64 metre below the top of the Logsfos dam.

The figure in Plate VIII shows the outlet of the pass in perspective.

\* Part of this dam being still in course of construction, no water flows at present into the pass when the river is *very* low.

† The dam here alluded to, was built during the spring of 1883.

Far more complex and imposing is *the pass at the Rukanfos*, which, indeed, up to the present time, so far as I am aware, has no rival in point of extent and difficulty of construction. The total height of the fall that had here to be overcome, amounts, as previously stated, to not less than 27.2 metres (89 English feet); and the rugged and precipitous rocks on all sides encompassing the cataract leave but very little space for the construction of a salmon-pass. Moreover, the periodical floods are of the heaviest, and the depth of the water both at the head and at the foot of the falls varies exceedingly, the greatest difference being as much as 6.6 metres (21.6 English feet). Hence special provision has been needed, not only to obtain space sufficient for the channel, but also to insure the pass against damage during the floods, and to render it effective whatever may be the height of the water.

Referring to the annexed illustrations (Plates III., IV., V., VI. and VII.), a detailed description is here given of this interesting salmon-pass.

By reason of the limited space, it was necessary to make choice of a system that would admit of a comparatively steep incline. Hence, the pass has been constructed chiefly on Mr. E. A. Brackett's system,\* with only a few minor modifications, that were found advantageous. The pass, which has a total length of 285 metres (935 English feet) is principally of wood (2½ inch planks); the first 73 metres only have had to be blasted in the solid rock. The wooden part (saving a few metres at the commencement of the pass) inclines 1 in 8 on its upper half, and on the remainder 1 in 7, whereas the slope of the channel blasted in the mountain-wall does not exceed 1 in 180.

The wooden part of the pass has a breadth of 2.82 metres, and — excepting the part nearest the outlet — a depth of 1.18 metres. The stops, with a height a trifle less than have the outer walls of the channel, viz., 0.94 metre, is, as previously stated, on Mr. E. A. Brackett's system, but differs from the drawings annexed to the description given in the above-mentioned Report from United States Commission of Fish and Fisheries in the following details:—

1. The opening B (see plan in Plate V) is 4 inches wider than are the openings A, C and D, whereas, in Mr. Brackett's figures, these openings have all the same width.

2. At A and E, a stop 8 inches high, wanting in Brackett's illustrations, is placed across the bottom of the channel.

These modifications serve to give the water a more uniform velocity at every point of the pass.

\* Described in Report from United States Commission of Fish and Fisheries, Part II, (for 1872 and 1873), p. 612.



The complex structure required for the wooden part of the channel, must obviously to a very considerable extent increase the length of the passage. The entire distance which salmon have to traverse in ascending from the outlet to the inlet of the pass amounts to about 785 metres, or very nearly half an English mile.

As will be seen from the elevation (Plate IV.), the outer walls of the pass are highest at the outlet, their surface being horizontal on the 23 lowest metres, whereas the bottom of the pass retains throughout this part the same incline that it has for some distance above it, viz., 1 in 7. Such being the case, the walls attain at the outlet a height of not less than 4.2 metres. The stops reach on this part, too, almost up to the top of the walls.

The object sought to be attained by this peculiar construction, which has never previously, I believe, been tested, is to increase, in a twofold manner the attractiveness of the pass. From the very great difference in the depth of the water at the outlet—varying as it does with the height of the river not less than 6.6 metres—the water in the channel, were the walls at the outlet of the same height as they are above it, would, during floods, inevitably overflow throughout a considerable part of the pass and thus seriously diminish the force of the current at the outlet, which, in that case, might easily fail to attract the attention of salmon. By reason of the increase in height given to the walls of the channel, the whole body of water, even in flood-time, is now made to pour through the narrow opening, and the force of the current must in that case be very considerable.

Moreover, the said construction of the terminal part of the pass admits of greatly augmenting the volume of water at the outlet. To this end has been constructed, from a point above the lowest of the falls (in Plate III., marked A), a subsidiary channel, provided with a sluice, through which a stream from the river may at any time be poured into the lower part of the pass, whereby its body of water can be increased to double the volume required to fill the upper part of the pass. The water from the subsidiary channel is gradually conveyed into the pass, the lower part of the former, which, throughout its entire extent, has the bottom pierced with parallel longitudinal openings, being given a position above the middle of the pass, into which therefore the water from the subsidiary channel successively streams. By means of this arrangement, both bodies of water are mingled without producing the slightest disturbance in the motion of the water in the pass, while giving to the lower part of the latter more of the character of rapids than would otherwise be the case.

It is obvious, that this peculiar construction of the lower part of

the pass must greatly enhance its attractiveness, and at the same time essentially contribute to provide an ample flow of water, be the height of the river what it may.

Also for the upper part of the pass, the remarkable difference occurring in the depth of the water has called for special contrivances.

About 27 metres below the upper extremity of the pass, where both walls of the channel consist of solid rock, has been erected a strong wooden dam, the upper surface of which lies higher than the highest flood water-line, which, at this point, extends 5 metres above the bottom of the pass.\* The dam being provided with a gate, the required body of water can at any time be poured into the pass. Meanwhile, it is manifest that, without special contrivances, the pressure of the water during floods would render it impossible for salmon to pass through the gate, since the difference in the height of the water immediately above and immediately below the dam might be upwards of 3 metres. To equalize this pressure, a number of regulating barriers (5), each with the upper surface 0.4 metre lower than that preceding it,† have been erected across the channel blasted in the rock, the bottom of which, as previously stated, is nearly horizontal. Each of these regulating barriers has at the bottom an opening 0.63 square metre. The distance from barrier to barrier varies between 4.5 and 13 metres. By means of this arrangement, the surface of the water in each successive compartment formed by the said barriers lies a trifle lower than it does in the preceding one, and the difference in height can never exceed 0.4 metre. Hence, the pressure will not at any point—except at the gate of the main dam during the heaviest floods—be such as to impede in the slightest degree the passage of salmon through the openings in the various barriers or in the said dam.

Unless the river be exceptionally low, more water will pass through the openings in the regulating barriers than is required to fill the part of the pass constructed on Brackett's system. That the proper volume of water may, at any time be conducted into this part of the pass, a strong wooden dam, provided with a gate, has been erected just below the last of the regulating barriers, or immediately above the point at which the wooden channel commences.

\* Owing to the configuration of the ground, the water in flood-time does not rise so high at this point as it does at the upper extremity of the pass.

† The difference in height, however, between the upper surface of the main dam and that of the nearest regulating barrier is considerably greater; for, the heaviest floods being of rare occurrence, it is quite immaterial whether salmon at such times can pass through the inlet-gate. Besides, the force of the water at the foot of the falls is there so prodigious, that salmon probably do not venture so far up as the outlet of the pass.

The upper surface of the dam lies about 0.8 metre higher than does that of the outer wall of the pass, which here, immediately above the dam, is horizontal for about 5 metres. Thus is formed a by-wash, or overfall, which carries off the surplus water. Another by-wash, immediately below the dam, gives additional security. By this means, the proper body of water will flow through the pass whatever may be the height of the river, and without as a rule involving any adjustment whatever of the gates or sluices.

Plate VII. shows the upper part of the pass in perspective.

To insure the pass against damage during the heavy floods, two massive flood-proof walls have been erected, one of which closes the creek into which the pass disembogues, while the other extends from the bank of the river to a large rock just above the outlet. The latter wall also serves to bear part of the pass, whereby space is economized.

At the inlet, the bottom of the pass lies about 0.8 metre beneath the lowest water-line, so that even when the river is dryest a considerable body of water pours into the pass. True, this is of no account whatever as regards the ascent of the fish, which never, probably, will move when the river is so very low, but, for the conservation of the woodwork, a most important fact, the pass being thus prevented from ever becoming dry. Moreover, the depth at which the inlet has been placed admits of conducting a stream of water from the pass to the hatching-apparatus, which, with its present arrangement, affords space for about half a million of salmon fry.\*

The volume of water in the pass is so regulated that a small quantity dashes over the stops, or transverse barriers. One advantage of this, is to agitate the surface of the water in the basins, which prevents the fish from being seen on its ascent of the pass, and therefore scared by people looking into the channel or by other surrounding objects.

As determined by measurement, the volume of water flowing through the pass amounts to 39 cubic metres a minute. This, however, does not include the volume — quite as large when wanted — that is poured through the subsidiary channel into the lower part of the pass. At the points in the pass where the velocity of the water is greatest (E and C, Plate V.), it reaches about 1.2 metres a second.

At the respective distances of 51, 111, and 172 metres from the outlet, resting-basins have been constructed for the salmon when ascending the pass. These basins vary somewhat in extent, the

\* Another hatching-house, affording space for at least double the number of ova, is now (1883) in course of construction.

lowest being a trifle smaller and the uppermost basin a trifle larger than the middle one, which has a length and breadth of 4 metres and a depth of 1.75 metres. Their object is not precisely to afford the salmon an opportunity of resting, since at no point probably will the ascent of the pass be attended with any considerable exertion to the fish, and even if it were, they could rest in several of the compartments of the pass. The idea with these spacious resting-places is rather to induce in the salmon a sense of their moving through a large body of water, and thus preclude the impression which the pass might otherwise convey of being a small brook or rivulet. Moreover, these resting-basins afford a means of computing the number of fish that ascend the pass.

In Plate VI. is given a general view of the pass, with the grand scenery surrounding it, from which some notion may be formed of the great difficulties that have had to be overcome. It should be mentioned, however, that the lowest part of the pass cannot actually be seen from the point of view selected by the artist, shut out as it is by the beetling rocks through which the channel in part has had to be blasted. In order to give a general view of the entire pass, these rocks, therefore, are not shown by the artist.

The effectiveness of both salmon-passes has already stood the test of experience. Thus, on filling, for the first time, the pass at the Logsfos (summer of 1880) a considerable number of salmon were found to have made their ascent after the lapse of a few hours; and, since then, it has been, repeatedly ascertained that well-nigh all of the fish that find their way to the foot of the falls, very shortly after ascend the pass. A more successful result can hardly be imagined. The pass at the Rukanfos was not finished till the winter of 1880-1881; accordingly, after the end of the period, during which salmon are affected by their migratory instinct, and the fish that had ascended the Logsfos pass were of course stopped by the Rukanfos, at the foot of which a considerable number could be frequently observed, in a spot where the current and the nature of the bottom would admit of catching sight of them. Moreover, salmon were on several occasions seen to leap at the fall. The following season (summer of 1881) however, the pass at the Rukanfos was also found to answer its purpose, salmon having repeatedly been observed in the uppermost resting-basin of the pass, from which exit was for a short time cut off by means of an iron grating. On removing the grating, it was no longer possible to compute even approximately the number of fish that ascended the pass; but that by far the greater part of the salmon which ascended the Logsfos pass also made their way up the pass at the Rukanfos, may be safely concluded from the fact that but very few

salmon, and those solitary fish, could be discovered under the latter falls, while, as previously stated, salmon had abounded in that spot the autumn before, when the Rukanfos pass was still in course of construction. Besides, salmon have been observed and occasionally taken, by people fishing for trout in the reaches of the river above the Rukan Falls. Altogether, the project has turned out a great success.

The undertaking has been planned by the author of this paper, Mr. A. Landmark, Inspector of Fisheries, and Mr. G. Sætren, civil engineer, the former having pronounced on all points touching what may be termed its "piscitechnical" features, or whatever will presumably affect the ability and inclination of salmon to ascend the passes, while all technical questions of a general character, relating to solidity of structure, price of labor and materials, and so forth, have been decided by Mr. Sætren.

The cost of construction has been defrayed by a body of shareholders (The River Sire Salmon Fishery Company, Limited) who have bought up the fishing rights on the part of the river extending from the Lundevand to the sea, and those attached to the coast for a distance of 4 or 5 miles on either side of the mouth of the river.

The formation of the company is principally due to the exertions of Mr. B. Soyland, steamboat agent, who takes the greatest interest in everything connected with Norwegian salmon fisheries.

The money as yet expended, exclusive of the sum paid down for the purchase of fishing rights, &c., amounts to close upon £1,300. That the cost of constructing the passes has not been heavier must be ascribed partly to the favorable conditions under which the work was carried on — more particularly as regards the height of the water — but chiefly to the low rate of wages and cheapness of timber in that comparatively remote part of Norway.

A. LANDMARK.

CHRISTIANIA, April, 1882.

## [E.]

NOTES ON THE EDIBLE QUALITIES OF GERMAN  
CARP AND HINTS ABOUT COOKING THEM.

BY CHAS. W. SMILEY.

The introduction of carp into the United States is of so recent date that there has been, as yet, but little opportunity to grow them of sufficient size to eat, or to get a full expression from our people of their opinions of carp as food. The first distributions by the United States Fish Commission were in 1879 and 1880. Many of these fish were put into unsuitable places and perished. Many persons whose carp have survived have prized them so highly that they have persistently refused to allow any to be eaten. As, however, an occasional newspaper muttering has come to hand, it has been thought best to get together at once what information might be available.

About the first of July, 1883, a circular was prepared containing fifteen questions, covering the whole field of carp-culture. One of these questions was as follows: "Have you eaten carp? How were they cooked, and what was the opinion of their edible qualities?" This circular was sent out, July 20, 1883, by direction of Professor Baird, to all persons who appeared from the records of the United States Fish Commission to have received young carp in 1879 and in 1880.

There have been received thus far over 600 replies, and from these have been copied verbatim everything which correspondents have said with reference to this subject. Over 350 had not yet tasted carp.

Finding that there was an occasional remark of an uncomplimentary character, I inquired of Professor Baird with reference to publishing any adverse statements. In reply, he said: "Certainly it is not our policy to suppress honest criticism of the carp, and you are authorized to collate the testimony and publish both sides. NO FISH IS FIT TO BE EATEN DURING AND IMMEDIATELY AFTER THE SPAWNING SEASON. Unless criticisms have been made of the fish

during the late fall or early spring they do not affect the question." I have accordingly classified and will present herewith every scrap of testimony—good, bad and indifferent—which has been received in reply to these circulars, together with such incidental remarks as had previously reached the United States Fish Commission. Of these latter, there are not over half a dozen, and they are mostly indicated by an earlier date attached.

I have spoken thus definitely concerning this material because when treated with exact impartiality the opposition to the food qualities of carp dwindles down into such utter insignificance that some one might easily suspect me of culling the material. This point is especially to be guarded, because it is so often considered praiseworthy to suppress criticism which is prompted by ignorance of facts and which might unjustly injure a good cause. And I am very sure that every unfavorable opinion of carp herewith presented, except perhaps that of Mr. Epes, is based upon ignorance or forgetfulness of one of three facts:

I. No fish should be eaten during or immediately after the spawning time.

II. The muddy taste of any fish can be largely removed by keeping the fish alive in a tub of pure water, changing it daily for a week.

III. Bad cooking will spoil the best of food.

Reports upon the edible qualities of carp have been received from twenty-three States and Territories, as follows:

*Table Showing the Number of each kind of Reports received from the various States and Territories.*

STATE.	I. Fair to very good.	II. Emphatic praise.	III. Favorable comparisons with other fish.	IV. Sometimes soft or muddy.	V. Criticisms.	VI. Bones.	VII. Cooking.	Total.
Alabama, . . . . .	1	3	1	-	-	-	1	6
Colorado, . . . . .	-	-	1	-	-	-	-	1
Connecticut, . . . . .	-	-	-	1	-	-	1	2
Georgia, . . . . .	1	11	4	1	1	1	3	22
Illinois, . . . . .	-	3	-	-	-	-	-	3
Indiana, . . . . .	-	-	-	-	-	-	2	2
Kansas, . . . . .	-	-	-	-	-	1	1	2
Kentucky, . . . . .	-	6	-	-	3	1	3	13
Maryland, . . . . .	6	21	16	4	2	-	7	56
Mississippi, . . . . .	-	5	3	-	1	-	-	9
Missouri, . . . . .	-	1	2	-	1	1	-	5
New Jersey, . . . . .	1	-	-	1	1	1	-	4
New York, . . . . .	2	1	-	1	-	-	2	6
North Carolina, . . . . .	3	6	2	1	-	-	-	12
Ohio, . . . . .	4	4	2	1	1	-	4	16
Pennsylvania, . . . . .	2	2	1	2	-	-	2	9
Rhode Island, . . . . .	-	1	-	-	-	-	-	1
South Carolina, . . . . .	1	1	2	-	-	-	-	4
Tennessee, . . . . .	4	5	3	2	-	1	1	16
Texas, . . . . .	3	12	1	-	-	-	-	16
Utah, . . . . .	-	-	-	-	-	-	1	1
Virginia, . . . . .	7	14	1	4	-	1	1	28
West Virginia, . . . . .	4	-	-	1	-	-	1	6
Canada, etc., . . . . .	1	-	-	-	-	-	1	2
Total, . . . . .	40	96	39	19	10	7	31	242

For convenience of reference the testimonies are classified as follows:

	Numbers.
I. Moderate praise, from fair to very good, 1-40, . . . . .	40
II. Unqualified praise and very emphatic expressions of approval, 41-136, . . . . .	96
III. Comparisons with other fish, very generally complimentary, 137-175, . . . . .	39
IV. Criticisms as to softness or muddy taste, 176-194, . . . . .	19



	Numbers.
V. Indifferent and uncomplimentary reports aside from muddy taste and softness, 195-204, . . . . .	10
VI. A few opinions in regard to bones, 205-211, . . . . .	11
VII. Favorable reports, containing hints upon various ways of cooking carp, 212-242, . . . . .	31
Total, . . . . .	242

Of these 242 reports, 38 only contain the slightest reflection upon carp (Nos. 141, 144, 149, 151, 159, 166, 176-194, 195-204, 208, 209, 210). Many of these objections are declaredly slight. All but one (No. 194) of the criticisms have already been explained away, and I believe we possess the clew to that one.

1. **MODERATE PRAISE — VERY FAIR TO VERY GOOD.** — In this list are included 10 testimonies, entirely satisfactory in character; 21 of which, in speaking of the edible qualities of carp, pronounce them "good," 14 "very good," and 5 "fair," "very palatable," etc. These statements come from thirteen different States of the Union; but rather largely from Maryland, Virginia, West Virginia, Tennessee, and Ohio. Messrs. Wilmot (5), White (21), Peirce (22), and Duke (39) are men of very large experience with fish, and weight should attach to their testimonies. The method of cooking most frequently named is frying, though all methods are included in this group of statements.

2. **UNEQUIVOCAL PRAISE AND VERY EMPHATIC EXPRESSIONS OF APPROVAL.** — Under this head are grouped 96 different testimonies. Of these, 15 speak of carp as "very fine," and 21 as "excellent"; and others ring the changes on such expressions as "very good indeed" "first rate," "first class," "extra," "splendid," "very superior," "superb," "delicious," "the best of fish"; while quite a good many go on to say that carp are equal or superior to any other fish, or that they never ate anything more delicious. Such testimonies in so large number are, of course, very gratifying, although the Fish Commission has never pretended that carp would take as high a rank as many of these people have given it. These assurances come largely from Maryland, Virginia, Texas, Kentucky, and Mississippi — sixteen States in all. Among the writers are several men of distinction, such as State fish commissioners, editors, physicians, and farmers and planters of wide experience. In many cases the single testimony represents the opinions of whole families or neighborhoods.

3. **COMPARISONS WITH OTHER FISH.** — Some 39 correspondents have chosen to express their opinions by comparisons rather than in absolute terms; and here we have carp successively declared

equal to buffalo, mullet, suckers, mud-fish, croakers, mill-roach, perch, rock-fish, drum, bass, trout, sun-fish, red-horse, mackerel, red-snapper, and shad.\* Of course the Commissioner, in bringing carp from Germany, did not for a moment suppose that he was introducing a fish equal in delicacy to trout, bass, or shad; but he has always claimed that its edible qualities were equal or superior to those of such fish as suckers, catfish, perch, buffalo, mullet, and sun-fish, and that by reason of its rapid growth, hardihood, and simple diet, it was more desirable for pond cultivation. Several of these replies (Nos. 100, 101, 140, 177, 186) indicate that scale carp are received more favorably than leather carp, while none speak of leather carp as superior to the scaled variety. In making these comparisons with other fish, all but six (Nos. 141, 144, 149, 151, 159, 166) place carp ahead of the fish with which they compare them. The reports cover the same wide range of territory as those in the preceding groups; here, as in the previous divisions, however, Maryland furnishing the larger number. The earliest distributions of carp were made to this State, probably on account of its proximity to Washington.

4. CRITICISMS AS TO SOFTNESS OR MUDDY TASTE. — Under this head are gathered 19 reports, a part of which speak of the carp as tasting muddy, and part alluding to their softness. Under other heads, No. 144 speaks of an "earthy taste," and Nos. 187 and 213 testify that soaking in salt water removed this taste. It may also be stated that removing the fish from a muddy pond, in which they would necessarily partake somewhat of the nature of their food, to a tank or tub of fresh water for a week, would very largely purify their systems. Carp is no exception to the rule that the flesh of animals will be affected by their food, but fish are exceptional in the ease with which this difficulty may be overcome. Many who have spoken of carp as being soft have betrayed their ignorance of the fact the flesh of all fish becomes soft and unsuitable for food during, and for a time after, spawning. Some of these correspondents have stated the time of the year when they ate their carp, thus conclusively proving this hypothesis. Particular attention is called, in this connection, to Nos. 39, 181, 190, 191, 192, 193. In regard to No. 194, it can only be said now that the water of the tank in which the gentleman kept his carp must

\* Most of the fish with which carp have been compared unfavorably are carnivorous species. To raise these on meat is expensive. Carp are vegetable feeders, and adapted to districts where fish are scarce and so remote from the ocean that sea fish cannot be obtained, but where corn, cabbage, pumpkins, squashes, potatoes, etc., are abundant and cheap. The Commission does not offer nor commend carp to those who have access to the better sea fish, such as salmon, trout, whitefish, etc. Compared with vegetable feeders, there is no question of the great superiority of carp.

in some way have become contaminated and have imparted its injuriousness to the carp. It is intended, however, to make a special investigation of this case, to ascertain what the contamination consisted in. While some have spoken of the sweet taste of carp (Nos. 55, 139, 189, 222), only Mr. Epes has objected to them as "too sweet" or "sickening."

5. OTHER UNCOMPLIMENTARY REPORTS. — Of the 194 testimonies above considered, none have presented unexplainable objections except perhaps Mr. Epes. We now come to 10 testimonies, most of which are lacking in particulars, in which are used such expressions as "nothing extra," unfavorable," "very poor," and, in three cases, "unfit to eat." There is, however, nothing to contradict the supposition that these people tried their carp in the spawning season, in which, as has already been said, any fish is unfit to eat. The anonymous newspaper clipping, No. 204, well illustrates the exaggerations in which people sometimes indulge when they know that they can conceal their names.

6. THE BONES. — Most people have given up the ridiculous hunt for a fish without bones; but, while four (Nos. 141, 208, 209, 210) have found more bones than they liked in the carp, six (Nos. 136, 185, 205, 206, 207, 213) found fewer bones than they expected.

7. HINTS UPON COOKING. — In 31 additional cases, correspondents, all praising the flavor of their carp, have added some suggestions as to the method of cooking. It is quite noteworthy that every person who has imparted some information about the proper methods of cooking has praised the carp. All methods of cooking have indorsements, but the large majority speak of frying. The number of times that different methods of cooking have been mentioned is as follows: Fried, 163; baked, 35; boiled, 20; broiled, 14; stewed, 5; a combination of boiling and baking, 2.

One (No. 91) advises frying the young and baking the old, and those who recommend baking usually speak of using large fish. The recipe in No. 242 is especially commended to those who would fry carp. The author of the wine method (No. 238), Mr. Blackford, will be recognized as one of the New York commissioners, and the retail fish-dealer of the Fulton Market.

#### I. — MODERATE PRAISES — FROM FAIR TO VERY GOOD.

1. FAIRLY GOOD. — I have eaten three mirror carp that unfortunately jumped out of a tub of water one night. Their edible quality was fairly good. They were fried in butter. — THEODOTUS GARLICK, *Bedford, O.*

2. FAIR. — Yes; fried; fair edible fish. — N. BLACKWELL, *Bartlett, Tenn.*

3. FAIR. — We have eaten them; they were fried, and of fair quality. — B. C. HINNANT, *Daingerfield, Tex.*

4. VERY PALATABLE. — Fried in bacon grease they are very palatable. — JOHN M. FERGUSON, *Alderson, W. Va.*

5. NOT INFERIOR. — As a table fish carp is not of an inferior quality by any means, and is largely consumed in the principal cities of Central Europe, as Vienna, Berlin, and Paris. — S. WILMOT, *New Castle, Ont.*

6. GOOD. — We ate four fried. They were good. — SOLOMON BYER, *Norton, Ohio.*

7. GOOD. — We have eaten a dozen or more, fried. All pronounce the fish good. — E. A. WELCH, *Catonsville, Md.*

8. GOOD. — Yes; they were cooked in water and eaten with butter sauce. The opinion of their edible qualities was a good one. — G. HILLJE, *Schulenburg, Tex.*

9. GOOD. — My family has, and said it was good. It was boiled. It was taken in hot weather in July. — E. B. WOODRUEF, *Morristown, N. J.*

10. GOOD. — I have. They were fried. The flavor was good. — Mrs. S. A. TEEL, *Kyle, Tex.*

11. GOOD. — They were cooked by a recipe from an English cook-book, and were good. — SAMUEL HOPKINS, *Highland, Md.*

12. GOOD. — Two. Fried in butter. Good. — LEWIS W. RUNNER, *Morgantown, W. Va.*

13. GOOD. — I have eaten but one, and was pleased with its flavor. — E. B. ISETT, *Spruce Creek, Pa.*

14. GOOD. — I ate the two caught a year ago last spring. Fried, they are good fish. — J. M. McADOO, *McEwen, Tenn.*

15. GOOD. — We have eaten but one, and that was fried. We think they are a good fish. — J. B. HAWXHURST, *Homowack, N. Y.*

16. GOOD. — We ate one fried, and pronounced it good. — S. P. MCFALL, *Newton Falls, Ohio.*

17. GOOD. — Have eaten them boiled and fried, and think them a good fish. — WILLIAM SHIRLEY, *5 S. Calvert Street, Baltimore, Md.*

18. GOOD. — We have eaten three fried. Their quality was good. I like them well. — J. B. HAGER, *Board Tree, W. Va.*

19. GOOD. — Have eaten some fried, and found them good. — R. D. MILLER, *Farmville, Va.*

20. GOOD. — One; fried. Good. — ABNER T. HOLT, *Bolingbroke, Ga.*

21. GOOD. — One small scale carp, accidentally killed in drain-

ing the pond, was fried as a pan-fish, eaten in my family, and pronounced good. — C. S. WHITE, *Romney, W. Va.*

22. GOOD. — I have not yet tasted carp. I prize my large ones too highly to kill them. Several friends have tested their table qualities, and all pronounce them good. — MILTON P. PEIRCE, *Philadelphia, Pa.*

23. GOOD. — I heard my son say he ate one, and that it was good. — DAVID BOWMAN, *Timberville, Va.*

24. GOOD. — Have eaten one fried, and found it good. — SOLON M. BOWMAN, *Timberville, Va.*

25. GOOD. — I ate one last year; don't remember how it was cooked. The edible qualities were good. — A. F. WHITMAN, *Nashville, Tenn.*

26. GOOD. — I have eaten only one. It was stewed, and part of it was fried. I consider it a good fish. — JAS. A. PETERKIN, *Fort Motte, S. C.*

27. VERY GOOD. — Yes. In the winter of 1882-'83, the pond was drained by muskrats and the carp were killed. The older ones then weighed nearly 3 pounds. They were considered very good eating. — RUSH TAGGART, *Salem, Ohio.*

28. VERY GOOD. — Two; fried; very good. — WILLIAM I. DUNN, *Sepulga, Ala.*

29. VERY GOOD. — Yes; boiled, baked, and fried. The edible qualities were very good. — P. C. CARLTON, *Statesville, N. C.*

30. VERY GOOD. — Only one; very good. — DAVID FARLOW, *Level Plains, N. C.*

31. VERY GOOD. — Those taken we ate. They were fried, and considered very good. — A. J. MICHENER, *Colora, Md.*

32. VERY GOOD. — Yes; and consider them very good. We ate one yesterday, fried. — FREDERICK ZAHN, *Frizellburgh, Md.*

33. VERY GOOD. — The one I caught was fried, and was thought very good. — R. WELBY CARTER, *Upperville, Va.*

34. VERY GOOD. — I had one fried, and considered it a very good fish. It weighed  $2\frac{1}{2}$  pounds. — J. W. PRICE, *Pincastle, Va.*

35. VERY GOOD. — I caught one last year weighing about one-half pound, which was cooked and thought very good by the family. — JAMES A. VAN BRUNT, *75 South Street, New York, N. Y.*

36. VERY GOOD. — I have eaten some, fried. I suppose they would eat better to some party who had not raised them. Others who have eaten them pronounce them very good. — FRANK W. GREEN, *Nashville, Tenn.*

37. VERY GOOD. — Fried. I thought they were very good. — WM. ARBAUGH, *Carrollton, Md.*

38. VERY GOOD.—We have eaten only two; fried in a pan. They were very good.—W. W. GRIER, *Charlotte N. C.*

39. VERY GOOD.—I ate one of about 1 pound weight in 1882, and another this spring. I thought them very good. This fall, after they have recovered from spawning, I will try another large one.—RICHARD T. W. DUKE, *Charlottesville, Va.*

40. GOOD AND VERY GOOD.—We have eaten one. It was fried in lard, and was pronounced good and very good.—MICHAEL SHANK, *Harrisonburg, Va.*

## II.—UNQUALIFIED PRAISE AND VERY EMPHATIC EXPRESSIONS OF APPROVAL.

41. VERY GOOD, INDEED.—Yes; one was taken out May 17, 1883, a very fine fish. It weighed 7 pounds less 1 ounce, and measured 22 inches. It was baked, and pronounced very good, indeed, by all who ate of it.—JAMES BAYLISS, *Massillon, Ohio.*

42. VERY GOOD, INDEED.—Yes; fried. They are very good indeed.—W. B. CHAPMAN, *Macon, Ga.*

43. HIGHLY ESTEEMED.—I have not; but hear of some that have, and that they are highly esteemed.—SHOTWELL POWELL, *Keysville, Va.*

44. WELL PLEASED.—We ate one, baked, that got caught in the chute. We were well pleased with the edible qualities.—A. H. BAKER & Co., *Fairfield, Ill.*

45. HIGHLY PLEASED.—We ate two. They were fried. We were highly pleased.—LOWREY & BERRY, *Blue Mountain, Miss.*

46. GOOD AND RICH.—We broiled two, and found them of good flavor, fat and rich.—GEO. N. FALK, *Lenoir, N. C.*

47. JUICY AND GOOD.—We ate three fried, and all were well pleased. They were juicy and good.—W. N. REEVES, *Eufaula, Ala.*

48. RICH, JUICY, BUT NOT DELICATE.—I have eaten about 3 or 4 fried. It is a good pan-fish, rich and juicy, but flesh not delicate.—I. RANDOLPH MORDECAI, *Baltimore, Md.*

49. DELICATE, WHITE, AND VERY NICE.—They are solid, delicate white meat, and very nice. They were fried.—JNO. R. BROWN, *Woodstock, Md.*

50. VERY NICE.—I ate one fried that weighed about 8 pounds, and it was very nice.—THOS. LONGBOTHAM, *Wortham, Tex.*

51. VERY NICE.—We have cooked them two or three ways, and find that the larger ones are very nice.—O. A. GILMAN, *Paris, Ky.*

52. VERY NICE.—I ate two of them fried; they were very nice.—JOHN HEETER, *Hunting Hill, Md.*

53. VERY TOOTHsome.—Yes; fried; and pronounced as very

toothsome by all who had the pleasure of partaking of them. — JACOB G. HEILMAN, *Jonestown, Pa.*

54. VERY FINE BAKED ; GOOD FRIED. — I have eaten three that were caught while fishing with hook for other fish and wounded in the mouth. We baked one three-pounder. It was very fine ; flesh firm ; good favor. We fried one of 2½ pounds. It was quite good. — JOHN G. KEITH, *Jackson, Tenn.*

55. VERY FINE, SWEET, AND RICH. — All report them very fine eating ; very fat, sweet, rich, and toothsome when fried. — H. C. LOOSE, *Hagerstown. Md.*

56. THE DUTCHMAN SAID IT WAS FINE. — The one who proposed my getting carp suggested that I bring it to him and let him serve it up, as he knew all about it, and that I should dine with him. I consented. The carp was eaten. I was not told when, but the Dutchman said it was fine. — P. S. CLARKE, *Hempstead, Tex.*

57. FINE. — Yes, sir ; and it was fine. It was fried. — J. N. THOMASON, *Paris, Tenn.*

58. FINE. — Have eaten them fried ; weight, 4 and 10 pounds. They were pronounced by all to be a fine fish for the table. — Mrs. A. B. WATTS, *Newton, Miss.*

59. VERY FINE. — Yes ; and very fine. They were fried. — W. H. SHIRLEY, *Harrisonville, Md.*

60. VERY FINE. — I ate two of them. I had them baked. Their edible qualities were very fine. — JAMES BUMGARDNER, Sr., *Greenville, Va.*

61. VERY FINE. — I have eaten them baked and broiled. They are a very fine food fish. — THOMAS HUGHLETT, *Easton, Md.*

62. VERY FINE. — My wife caught one with her hands while I was from home. She pronounced it very fine. She fried it in lard. — J. A. DULA, *Lenoir, N. C.*

63. VERY FINE. — I ate one ; baked it. The flavor was very fine. — C. W. ALEXANDER, *Charlotte, N. C.*

64. VERY FINE. — I have eaten several while some of my friends were participants. All pronounced them very fine cooked by frying in plenty of lard. — S. M. CLAYTON, *Cyrustown, Tenn.*

65. VERY FINE. — They are very fine. — WM. ELLIOTT, *Taylor, Tex.*

66. VERY FINE. — Persons who have eaten them cooked in the ordinary way (fried) say they are very fine. — C. J. WATSON, *Munfordville, Ky.*

67. VERY FINE. — I have not. Those of my neighbors who have pronounced them very fine, either fried or boiled. — T. M. HIPNER, *Mortonsville, Ky.*

68. VERY FINE. — In my absence one of the oldest was caught

with a hook. When landed the line parted, and the fish was injured so that it could not be returned to the pond. It was fried and pronounced by the family very fine.—JAS. G. FIELD, *Gordonsville, Va.*

69. VERY FINE.—I ate two of them and found them a fish of very fine quality, much better than I anticipated.—F. S. EVERIST, *Port Deposit, Md.*

70. VERY FINE.—I have eaten a few. They were fried as we usually fry other fish. I have found them very fine pan fish.—JOHN MCFADDEN, *Sudlersville, Md.*

71. VERY FINE.—The few eaten were fried, and were very fine food—remarkably good.—CHRISTOPHER & ROBERTS, *Fairburn, Ga.*

72. VERY FINE.—What fish I have taken from my pond to eat I have had baked and have found them very fine eating.—I. C. PLANT, *Macon, Ga.*

73. VERY FINE INDEED.—We ate only two. These were fried, and we considered them very fine indeed, and only wished we could have more.—H. L. SPENCER, *Social Circle, Ga.*

74. NUMBER ONE.—Yes, they were fried, and were thought by different persons to be No. 1.—THOMAS R. TULLOSS, *Rock Hill, Tenn.*

75. FIRST RATE.—I have, fried; first rate.—LEWIS BARLOW, *Sykesville, Md.*

76. FIRST RATE.—I have tasted three of the oldest. They were fried, and the quality was first rate.—J. M. BROOKS, *Waterford, Miss.*

77. FIRST CLASS.—My neighbors and myself ate one, after frying it as we would any other fish, and all unite with me in pronouncing it a first-class table fish.—GEORGE M. EMACK, *Versailles, Ky.*

78. FIRST CLASS. Yes, fried. They are first class in every way.—J. A. LONG, *Yanceyville, N. C.*

79. FIRST CLASS.—Had one cooked. It was first class.—W. G. DELASHMUTT, *Martinsville, Ill.*

80. FIRST CLASS; WHITE AND FINE.—I caught two last year that weighed  $5\frac{3}{4}$  lbs. We baked them, and regard them first class, either baked or fried. The flesh is of a white texture, and fine.—A. SHINKLE, *Covington, Ky.*

81. EXTRA.—We have caught and eaten some fried, and claim them extra in quality.—S. O. HAWKINS, *Bucks, Ohio.*

82. GOOD ENOUGH; EXCELLENT.—Yes, a great many, both fried baked. By our best judges carp is considered excellent. They



are good enough. On account of their rapid growth and size they are better for baking.—GREENE B. MOBLEY, *Eutaw, Ala.*

83. EXCELLENT.—Yes, fried. They were pronounced excellent by every one who tasted them.—ABRAM E. NULL, *Union Bridge, Md.*

84. EXCELLENT.—Yes, one that was caught. It was fried and considered excellent eating.—R. K. DABNEY, *Powhatan C. H., Va.*

85. EXCELLENT.—We have eaten one in April. It was pronounced by all a fish of excellent quality.—I. C. DONALDSON, *Gilbertsville, N. Y.*

86. EXCELLENT.—My partner ate one, and pronounced it excellent.—A. P. BROWN, *Jefferson, Tex.*

87. EXCELLENT.—We had them fried once; they were pronounced to be excellent.—J. W. SHIMWELL, *Prince Frederick, Md.*

88. EXCELLENT.—Four, fried. Taste excellent.—CHARLES SENSEMAN, *West Charleston, Ohio.*

89. EXCELLENT.—We ate two old fish and five young ones. Fried. Quality excellent.—GUSTIN HAVENS, *Lewis Center, Ohio.*

90. EXCELLENT.—Have eaten some and think them an excellent table fish.—HARRISON SUMNEROUR, *Warsaw, Ga.*

91. EXCELLENT.—Yes. Fried the young ones, and baked the old ones. Edible qualities were excellent.—W. M. THORNTON, *Lake, Miss.*

92. EXCELLENT.—One, fried, was excellent.—A. H. WILKINS, *Whitesborough, Tex.*

93. EXCELLENT.—Only one, which was fried. All who tasted it pronounced it excellent.—FRANCIS PRIDE, *Cedar Hill, Tenn.*

94. EXCELLENT.—In the summer of 1882, with hook and line, I caught three, one weighing  $3\frac{1}{2}$  pounds, the other two  $2\frac{1}{4}$  and  $2\frac{1}{2}$  pounds, respectively. They were fried, and pronounced by the company to be "excellent."—JOSEPH LIGON, *Massie's Mills, Va.*

95. EXCELLENT.—Got surprised. Yes; broiled and they were excellent in flavor and consistency—much to my surprise.—R. EMORY, *M. D. Taylor, Md.*

96. EXCELLENT.—I have eaten carp in Europe frequently and found them an excellent pan-fish.—C. BOHN SLINGLUFF, *Towson, Md.*

97. EXCELLENT.—I have eaten none myself; but those caught in Hardware were said to be excellent.—fried and boiled.—HENRY M. PRINCE, *M. D., Scottsville, Va.*

98. EXCELLENT.—We had two cooked; one baked, the other fried. They were excellent.—EMANUEL HEYSER, *Madison, Ga.*

99. EXCELLENT; NOT GAMY NOR FISHY.—Yes, one. Baked and stuffed. The meat was white and of the consistency of shad. It

had no game taste whatever and none of the fish taste. With condiments and being well cooked, all pronounced the dish excellent.—WM. E. SMITH, *Albany, Ga.*

100. SCALE CARP EXCELLENT.—Ate several fried. The scale carp I consider excellent. The leather carp not so good.—H. B. DAVIS, *Macon, Ga.*

101. EXCELLENT; SCALE CARP THE BEST.—I have eaten one of each variety and much prefer the scale carp to the leather. They were boiled, and considered excellent.—A. W. OVERTON, *Frankfort, Ky.*

102. MOST EXCELLENT.—Have eaten one—fried it. Think it a most excellent table fish.—C. C. DAVID, *Harmony Grove, Ga.*

103. MOST EXCELLENT.—Mayor T. J. Jarratt had one of the carp baked and it was pronounced by himself and other members of the family and also by Capt. E. A. Goodwin, who was invited to partake of it, as a most excellent fish. Mr. Coleman, the keeper of the Central Park, also speaks of it as very palatable.—*Petersburgh, Va., Index-Appeal, August 12, 1882.*

104. SPLENDID; NONE BETTER.—We have eaten some. We had them fried, and thought they were splendid. I don't think there could be any better fish.—JAMES W. OGLE, *Union Bridge, Md.*

105. SIMPLY SPLENDID.—Fried, and simply splendid.—M. S. GILMER, *Mathews, Ala.*

106. VERY SUPERIOR.—They are cooked according to fancy as other varieties, and are very superior in flavor. As a baking fish, they are very superior.—L. T. WHEELER, *Corsicana, Tex.*

107. SUPERB.—We ate one, which was superb.—PETER BONDS, *Harrisonburg Va.*

108. SUPERIOR.—We have eaten a few of them and consider them a good eating fish. They were cooked the same as shad—fried. We look upon them as a superior fish.—JAMES HARBAN, *Dayton, Md.*

109. DELICIOUS.—Only once. They were fried in the usual way and were pronounced very palatable and delicious.—DANIEL WOLF, *Fairplay, Md.*

110. DELICIOUS.—Yes. Thy were fried and were delicious.—THOMAS V. RICHARDSON, *Phoenix, Md.*

111. DELICIOUS.—Fried; they were delicious.—J. M. WALKER, *Mexia, Tex.*

112. DELICIOUS.—Only one, weighing 3½ lbs., which was fried, and my family pronounced it delicious.—SAMUEL ANDERSON, *Rutland, Md.*

113. DELICIOUS. — Only upon one occasion, and fried. It was delicious. — J. W. DOWNEY, M. D., *Newmarket, Md.*

114. GOOD AS HE WANTS. — I have eaten 2 of the first lot merely to try them. The quality was as good as I want. They were only fried. — M. B. E. KLINE, *Broadway Depot, Va.*

115. FINE AS EVER TASTED. — I have eaten one and had it fried. It was as fine a flavored fish as I ever tasted. — W. K. HUNTER, *Rolesville, N. C.*

116. OILY, AND FINEST FISH HE EVER ATE. — We have eaten nine and given away three. We fried them like other fish. They contained nearly oil enough to cook themselves and were very fine — finest I ever ate. — HENRY PULSE, *Harrisonburg, Va.*

117. NEVER ATE BETTER FISH. — One killed through a mistake was fried, and we never ate a better fish. — ROBT. H. RICKS, *Rocky Mount, N. C.*

118. NEVER ATE BETTER FISH. — Have had them fried and don't think I ever ate any better fish in my life. — MRS. M. A. WALLACE, *Sherman, Tex.*

119. NEVER ATE BETTER FISH. — Have fried them, and never ate better fish. — WM. O. YAGER, *Luray, Va.*

120. BETTER THAN ANY OTHER FISH. — I have had three messes; one last year, and two since. They were fried. They eat very well — better than any other fish in the country. — J. T. LOW, *Saulsbury, Tenn.*

121. VERY BEST. — We eat two large ones. They were broiled. The quality was of the very best. — DR. SAMUEL HAPE, *Hapeville and Atlanta, Ga.*

122. BEST OF FISH. — I have eat 5 or 6 weighing from 1 to 1½ lbs. each. We fried them in butter, and all who have partaken of them have pronounced them the best of fish. — MICHAEL WILLAX, *Baltimore, Md.*

123. BEST THEY EVER ATE. — We have eaten one which was fried. It was decidedly the best we ever ate. This was testified to by several. — JOHN C. WENGER, *Dayton, Va.*

124. BEST FISH HE EVER ATE. — Yes, they were broiled and were very nice — the best either of salt or fresh-water fish that I have ever eaten. — H. G. SANFORD, *Warren, R. I.*

125. BEST FISH THEY EVER DID EAT. — Yes, we used them all last summer, and gave a mess to all our friends and neighbors. All with one voice say they are the best fish they ever did eat, and we say so too. Cook them as you please. They are good enough for any man. — SAMUEL McCLELLAND, *Salt Springs, Mo.*

126. NEVER ATE A SUPERIOR FISH. — In draining my ponds last year I caught a carp 18 inches long and had it fried. I

never ate a superior fish. My family pronounced it excellent. — E. G. PEYTON, *Hazlehurst, Miss.*

127. SUPERIOR TO ANY OTHER FISH THERE. — We have eaten two, which were fried. They were delightful and have superior qualities over any other fish here. — WM. L. HUDSON, *Luray, Va.*

128. FAR SUPERIOR TO ANY TEXAS FISH. — Yes, stewed and fried. They were splendid both ways, far superior to any Texas fish, in our estimation. — WILLIAM BRUEGGERHOFF, *Austin, Tex.*

129. GOOD AS ANY. — We have baked them and they are as good as any fish we ever ate. — J. SHAW MARGERUM, *Washington, Pa.*

130. EQUAL TO ANY FISH. — I have eaten some. They were fried and were an excellent table fish; equal to any species of fish. — WM. A. JETT, *Atlanta, Ga.*

131. EQUAL TO ANY FISH IN THE COUNTRY. — I have not, but several of my neighbors have and pronounce them equal to any fish in the country. — MONROE POINTER, *Como Depot, Ill.*

132. NICEST FISH EVER TASTED. — They are the nicest fish I ever tasted. We fried them the same as other fish. — WM. A. RIDGELY, *Glenwood, Md.*

133. FINEST FISH IN THE COUNTRY. — Have eaten none here, but plenty in Germany, and know it is the finest fish we have in our country. — WILLIAM RADAM, *Austin, Tex.*

134. NEVER ATE ANYTHING MORE DELICIOUS. — We ate the one 8 inches long, cooked with fine lard. I had visitors, and all joined in saying they never had eaten anything more delicious. I know I never will. — JOHN HOUSTON, *Farmville, Va.*

135. MOST EXCELLENT FISH THEY EVER ATE. — I killed a dozen. My family and neighbors had them fried, and all pronounced them the most excellent of any fish they ever saw. — E. C. DICKINSON, *Rusk, Tex.*

136. A CRUCIAL TEST WITH MAGNIFICENT RESULTS. — Eight out of ten men with whom we have ever conversed about the table qualities of the German carp have affirmed that the fish was unsurpassable as an article of diet, but every now and then there comes along a ninth and tenth man who pronounces it coarse, dry, and not fit to eat. Our mind being thus unsettled on this great subject — and the present absorbing public interest in the carp culture demanding a dissipation of all doubts — we addressed a note to our old friend, Capt. A. D. Bates, of Batesburg, the pioneer of carp-raising in our county, begging that he allow us to spend a day with him and test the qualities of the carp. His reply was, "Come any day you please. Bring whomsoever you please. I shall be delighted, and you shall eat fried carp three times a day."

As regards the carp at dinner, it was in this wise: There were two dishes of them, 7 or 8 on each dish, fried. All these were in size from one to two pounds. They were fried as shad are. And certainly — and in all honesty and sincerity — we have never tasted a more delicious fish. So far from being dry, they are precisely the opposite; though as they grow older, the flesh becomes more solid. They have but few bones; the backbone and ribs, with but few besides. As we ate of the fish, the thought occurred to us that perhaps there was more in the cooking than in the fish. We intimated this thought to Mrs. Bates, who laughingly assured us that the frying process was of the very simplest, and that the fish were standing emphatically upon their own merits. In conclusion, we beg to say that if our personal and individual experience of the table qualities of the German carp will be any encouragement to them in carp-raising, we again affirm, without fear of successful contradiction, that the carp is an exceedingly delicious fish, and well worthy of any pains that may be bestowed upon it. — JAS. T. BACON and THOS. J. ADAMS, *Editors of the Edgefield Advertiser, Edgefield, S. C., March 29, 1883.*

### III. — COMPARISONS WITH OTHER FISH — VERY GENERALLY COMPLIMENTARY.

137. GOOD; EQUAL TO BUFFALO. — Have eaten several that were fried. We consider their edible qualities good — equal to the buffalo in the Ohio River. — MATTHEW B. CARTER, *Shaker, Ohio.*

138. EQUAL TO BUFFALO. — We ate one, fried, which got caught in the ice and was killed. It was about as good as a buffalo, though if it had been fresh perhaps it would have been better. — G. W. VARNUM, *Montgomery City, Mo.*

139. EQUAL TO MULLET. — I have eaten 140 fried. I found them something like the mullet. They are very nice, and sweeter than any other fish. Rather too sweet for some. — CHARLES J. RIDDLE, *Fork, Md.*

140. EQUAL TO BRANCH MULLET, OR SUCKERS. — Scale carp, first rate in quality. Leather carp, not so good, being more like the branch mullet or sucker. — BENJAMIN D. PALMER, *Sandy Spring, Md.*

141. EQUAL TO SUCKERS. — I have eaten only one. It was fried. I think it is about equal to our common sucker — fully as bony. — G. M. GALLASPY, *Decatur, Miss.*

142. EQUAL TO CATFISH. — A few days ago we ate two of the last lot, fried. They compared very well with ordinary fish — something similar to catfish. — P. PEYTON CARVER, *Mount Juliet, Tenn.*

143. EQUAL TO OTHER POND FISH. — Have not given them a fair trial, but think them equal to other lake fish. — I. A. EDMONDSON, 48 South Calvert Street, Baltimore, Md.

144. EQUAL TO CROAKERS, MILL-ROACH, AND MUD-SHAD. — I have eaten some fried. I did not think they rated above croakers, mill-roach, or mud-shad. They had an earthy taste. I have never eaten them any other way than fried. — ANDREW REESE, Luther-ville, Md.

145. EQUAL TO PERCH. — They eat very much like the perch that is found in our creeks and rivers. — JAMES T. BARTLET, Trappe, Md.

146. EQUAL TO PERCH. — Yes, they were fried, and I thought them equal to our salt water perch, which are good. — F. I. WILEY, Charlotte Hall, Saint Mary's County, Maryland.

147. EQUAL TO PERCH. — We have eaten some. They were fried, and the flesh tasted similar to that of a perch. — GEORGE R. PARROTT, Still Pond, Md.

148. EQUAL TO ROCK FISH. — We have fried 12 or 15 of them and found them equal to pan rock. — JAMES BURTON, Greenwood, Md.

149. EQUAL TO DRUM BUT NOT TO PERCH OR BASS. — Yes, three. Two were fried and one boiled. They were eaten in the winter, and opinion was expressed that they were a good coarse fish, about equal to drum, inferior to perch or bass. — WILLIAM L. YOUNG, Waverly, Miss.

150. NOT EQUAL TO BASS. — Yes, very fair. They are not as good as bass. The flesh has not much flavor and is soft. — M. GILLET GILL, Baltimore, Md.

151. NOT EQUAL TO THE RIVER FISHES. — In April, 1882, I tasted of a baked carp weighing some 5 pounds, properly seasoned and cooked. I think it inferior to any of our running stream fishes for the table in flavor and texture. — IRA P. JONES, Nashville, Tenn.

152. QUITE SUPERIOR TO NATIVE FISH. — I have eaten two messes. They were fried and very fine; quite superior to our common fish. — J. C. KEITHLEY, Shackleford, Saline County, Missouri.

153. BETTER THAN PERCH OR CATFISH; NOT EQUAL TO BASS OR TROUT. — In June, 1882, I caught several estimated at one and a half pounds. All were returned to the water except two, which were baked and eaten. They were considered as "good"; not so good as bass or mountain trout, but better than perch or catfish. — MATTHEW A. MILLER, Richmond, Va.

154. NOT EQUAL TO TROUT OR SHAD. — Yes, I had some prepared

as fish generally are. My opinion is that they are the fish for the people, but not so good as the trout or shad. — C. M. COE, *Atlanta, Ga.*

155. NOT EQUAL TO TROUT. — I have eaten carp from another's pond. I liked them pretty well — not so well as trout. They were fried. — PEMBERTON WOOD, *Union Bridge, Md.*

156. NOT EQUAL TO TROUT OR PERCH. — I commenced in 1882, and have been eating on them ever since. I am getting old and could not wait any longer. We fry and stew them. They are very good, either way — not equal to the trout or perch. — M. S. FINCH, Sr., *Wortham, Tex.*

157. NEXT TO TROUT AND PERCH. — Good; only surpassed by our native trout and perch. — E. L. MCGEEHEE, *Woodville, Miss.*

158. BETTER THAN SUNFISH OR TROUT. — Fried, and better than the sunfish. I prefer them to the mountain trout from my pond near by or to my eastern trout bred here. — ADDISON BAKER, *Denver City, Colo.*

159. BETTER THAN RED-HORSE — NOT EQUAL TO BREAM. — One only — of the scaly variety. It was fried and pronounced fine — not equal to the bream, but better than red-horse, which it resembles. — S. W. BOOKHART, M.D., *Blythewood, S. C.*

160. EQUAL TO SHAD, RED-HORSE, BLACK BASS, OR SUCKERS. — They are equal to the shad, red-horse, black bass, white sucker, and other fish we get here. — ABEL A. WRIGHT, *Griffin, Ga.*

161. EQUAL TO ANY NATIVE FISHES. — Yes, fried. They are equal to any of our native fishes. — H. I. IRLY, *Eufaula, Ala.*

162. EQUAL TO BLACK BASS. — I think they are as good as black bass. — WM. DOWNEY, *New Market, Md.*

163. BETTER THAN BLACK BASS, ROCK OR MACKEREL — EQUAL TO SHAD. — We have, fried. We consider them equal to shad, superior to black bass, rock or mackerel, and we wish for nothing better. They are the fish for the million. — EDWIN H. REYNOLDS, *Rising Sun, Md.*

164. EQUAL TO BASS OR PERCH — SUPERIOR TO LAKE FISH. — The first one was caught about September 1, which we did not expect to be extra on account of the warm weather, but to our surprise it was excellent, and by one guest who is used to eating fish caught fresh from Lake Michigan and from different streams of this State, it was pronounced equal to the creek bass or perch, as it is sometimes called, which is considered the best fish we have, even superior to lake fish. We all thought it far better than catfish or suckers. It was not oily or coarse, as some papers have stated. Three persons besides our own family of four grown persons partook of it, and all liked it. The other fish was caught in October, after the weather

became cooler, and four people, all different from the first party, besides our family, ate of it, the same opinion being expressed as before. We who ate of both could see no difference, unless it was a very little more firmness to the flesh of the last. — GUSTIN HAVENS, *Lewis Centre, Ohio, April 6, 1883.*

165. NEARLY EQUAL TO RED SNAPPER. — Have eaten no carp under 2 pounds, at which weight they are an excellent pan fish, only the flesh is a little soft. An eight-pounder baked is nearly as good as a red snapper. — B. J. WILSON, *Atlanta, Ga.*

166. NOT EQUAL TO SHAD. — Yes, and I do not consider them first class for eating. They will not compare with shad and other fine fish in North Carolina waters. — H. B. WRIGHT, *Saulsbury, Tenn.*

167. NOT EQUAL TO SHAD. — Yes; they were fried as we cook herring and their quality was fair, but not so good as Potomac shad. — ASA M. STABLER, *Spencerville, Md.*

168. EQUAL TO SHAD. — We ate one this morning. It was broiled. It was very good — something like shad. — WM. THOMPSON, JR., *Lemont, Pa.*

169. EQUAL TO SHAD. — I have. They are first rate, about equal to boiled shad. — SAMUEL T. EARLE, *Centreville, Md.*

170. EQUAL TO SHAD. — Yes, fried; most excellent, equal to shad. — IRA A. FITZ GERALD, *Linwood, N. C.*

171. EQUAL TO SHAD. — I cooked four during last year. They were fried as we usually prepare shad, and I consider them equal to shad. — RICHARD H. CORNEGYS, *Greensborough, Md.*

172. EQUAL TO TROUT OR SHAD. — Yes, baked and fried, fresh from the water. It was equal to trout, and I think equal to shad. — DR. H. H. CARY, *La Grange, Ga.*

173. BETTER THAN SHAD. — We have eaten two fried and consider them better than shad. — WM. B. TEWELL, *Rockhill, S. C.*

174. BETTER THAN SHAD. — Yes, baked; superior to shad. — H. G. EVANS, *Hendersonville, N. C.*

175. BETTER THAN SHAD. — Two, baked. I found them an excellent table fish — in my estimation far superior to shad. — ADOLPH J. GALL, *Jessup's, Md.*

#### IV. CRITICISMS AS TO SOFTNESS OR MUDDY TASTE.

176. GOOD, BUT A LITTLE SOFT. — We have eaten some few fried. They were good. Little on the soft order. — JOS. HAYGHE, *Upper Cross Roads, Md.*

177. SOFT. — The scale carp are best. The others are too fat and soft. — SAMUEL M. SUBERS, *Macon, Ga.*

178. SOFT. — We ate two, fried in butter. They were pleas-



ant tasted, but the flesh was most too tender. — J. W. HIGBEE, *Castle Shannon, Pa.*

179. EXCELLENT, PERHAPS SOFT. — I ate two fried. Their table qualities were excellent. The first one was a little too fat and the meat a little soft. — C. C. LOBINGIER, *Braddock, Pa.*

180. TOO SOFT. — I do not think them a good pan fish, being too soft. They are good boiled. — ROBERT E. WITHERS, *Wytheville, Va.*

181. SOFT AND OF A MUDDY TASTE IN JULY. — Cooked in lard. I did not like them. I found them to be soft and strong in flavor. I think it was July 8th that I tasted them. — WM. SALWAY, *Superintendent of Spring Grove Cemetery, Station A, Cincinnati, Ohio.*

182. SOFT AND OF A MUDDY TASTE. — I have eaten them fried several times. I do not like them very much. They are soft and taste a little muddy. — SAMUEL ROOP, *Westminister, Md.*

183. MUDDY TASTE. — I tried to eat a 3-pound scale carp, but found it strong, with a disagreeable, muddy flavor. We fried and served it with spiced sauce. Some of mine are the leather variety, and perhaps they may prove better. — THOMAS CLAPHAM, *Roslyn, N. Y.*

184. A LITTLE MUDDY TASTE. — I have eaten some fried in lard that was fat, very good except a little musty taste. — ANDREW MANN, *Forest Hill, W. Va.*

185. MUDDY TASTE DUE TO POND. — The Albright mill pond was drawn off yesterday and Mr. J. E. McKnight gave us a small carp which we had cooked. The flesh was white and rather soft. The fish does not have many bones; but this one was not of fine flavor, having a muddy taste. This, however, may be owing to the character of the pond, which is a very old one, filled with red mud, and very offensive. — *The Daily Bugle, Jas. W. Albright, Editor, Greenboro, N. C., May 2, 1883.*

186. CAUSE OF MUDDY TASTE. — I have eaten them, both fried and broiled. I think the scale carp superior to the leather, but the quality of the carp depends upon their food. If left to care for themselves they will taste of the mud. — L. TRIPLETT, JR., *Mount Jackson, Va.*

187. HOW TO AVOID MUDDY TASTE. — We ate a few last spring, fried. They tasted of mud unless they were first soaked in salt water. After being soaked over night they were very good. The meat is firm. What I used were scale carp. — CAPT. JNO. T. FLETCHALL, *Poolesville, Md.*

188. SOME NOT GOOD, AND SOME VERY GOOD. — I ate three carp which weighed two pounds each. They were fried and I did not think much of them. The flesh was not very solid and had a

sweet taste. Those eaten were in April before they had spawned, and while I and some of my family did not like them, one of my neighbors, to whom I sent one, thought it very nice. These fish were some of the original lot received from you. I have this last week eaten some of the two-year olds, weighing  $\frac{1}{2}$  pound each, and all liked them very much. — E. L. TSCHIFFELY, *Hunting Hill, Md.*

189. SOFT IN JUNE. — We baked a 3-pound one taken from a very small and warm pond. We found it of good flavor, and sweet, but very soft. It was killed late in June, and was full of roe. — LEONARD V. GREEN, *Norwich, Conn.*

190. NOT GOOD WHEN SPAWNING; OTHERWISE VERY FINE. — Only one, but about spawning season. It was strong tasted. I am assured, however, that they are very fine at other seasons, and even then if too young to spawn. — J. W. MEWBORN, *Macon, Tenn.*

191. NOT GOOD IN AUGUST; SMALL ONES VERY FAIR. — We have tried one weighing 10 pounds, and gave away others about that size. They were stuffed and baked. I think they are the poorest food-fish ever eaten. Even the smell is offensive. July 25, 1883.

The large carp I wrote about as being so offensive when cooked was served up in the month of August.

The small carp, say  $\frac{1}{2}$  pound to  $1\frac{1}{2}$  pounds, we catch with worms at the present time. The parties who have eaten them say they think them a very fair pan fish. — WILLIAM GRISWOLD, *Jobstown, N. J., July 30, 1883.*

192. RESULTS OF EATING CARP SOON AFTER SPAWNING TIME. — It must be remembered that the taste of mankind is so different that what would delight one would disgust another. We had a carp boiled by a German, but none of our party liked it thus cooked. The next was stuffed splendidly and baked. This was found more palatable. As a pan fish we must say that those fortunate people who know how a 13-inch freckle, such as you catch in Surrey and Sussex Counties, tastes will not take any stock in this new comer. But my opinion is that on a cold, frosty morning in October the carp will be found to be good eating, if properly cooked. — R. A. MARTIN, in the *Petersburgh, Va., Index Appeal*, Aug. 12, 1882.

193. DO NOT EAT CARP IN SPAWNING SEASON. — Last November one gentleman got a carp 20 inches long, and all who ate of it said it was O. K. Two others tried one, each in spawning season, and said they were not good. Of course these persons knew nothing of carp culture. — S. J. ALEXANDER, *Macon, Tenn. July 3, 1883.*

194. INFERIOR AND SICKENING AFTER TWO WEEKS' CONFINEMENT IN A RAILROAD TANK. — It was in the months of December and February that I tasted the carp. On one occasion I caught four out of my pond and put them in a railroad tank containing some 5,000 gallons of water which was changing every day or so. I put them in there, not for the purpose of changing their condition or edible qualities, but I was expecting a friend who was thinking of getting some, and I wanted him to taste them. I put them in the tank so that I could take a net and get them at any minute. But my friend did not come at the time I expected him and the carp *remained in the tank over two weeks*, being fed in the meantime on bread alone. This tank is a large wooden tub containing over 5,000 gallons of water. I served the carp in three different ways for the table, and in all the different ways it still retained its muddy, strong, fishy, sweet, sickening taste. Three out of four who ate any complained of a little sickness at the stomach after eating them. After trying myself I sent a half dozen or more to friends in the village, and every one who ate them said it had the same taste to them as above. I must say I think it the most inferior fish I ever ate. I tried hard to see if I could not overcome some of my bad opinions of the fish, as I had gone to the expense of fitting up a nice pond especially for them, but facts are stubborn things. I am now stocking my pond with black bass in order that they may eat up the young carp, as I think them worthless for anything else. — COPELAND D. EPES, *Nottoway C. H., Va.*

V. — THE ONLY UNCOMPLIMENTARY REPORTS ASIDE FROM THOSE KNOWN TO BE DUE TO EATING CARP IN THE WRONG SEASON.

195. RATHER INDIFFERENT. — Have eaten several fried and considered them rather indifferent. — ROBERT M. STABLER, *Spencerville, Md.*

196. NOTHING EXTRA. — I ate two of them; I thought them nothing extra. — J. L. WOOLFOLK, *Madisonville, Ky.*

197. OPINIONS DIFFER. — Have eaten a number of them; most of persons pronounce them fine, others differ. — W. W. TUNIS & BRO., *Tunis Mills, Md.*

198. COULD NOT TELL. — We have fried and eaten two of the fish that we found in the grass with some hook holes through their mouths. Thieves had dropped them. We could not tell much about the quality. — JOHN B. BROWN, *Nashville, Ohio.*

199. UNFAVORABLE. — Opinion not in favor of carp. — JOHN COLLINS, *Bernardsville, N. J.*

200. VERY POOR. — I have. They were fried in hogs' lard.

Their edible qualities were very poor. — JOSIAH PERRY, *Covington, Ga.*

201. DOES NOT LIKE THEM AT ALL. — We have eaten them several times, always fried in butter or lard, after being rolled in meal. I do not like them at all. — OSCAR REID, *Ferguson, Mo.*

202. UNFIT TO EAT. — Have eaten one and pronounced it decidedly unfit for table use. — R. PAYNE, *Georgetown, Ky.*

203. WORTHLESS FOR EATING. — Yes, have eaten a few, baked, fried, and broiled. Their edible qualities are not good. I was very much disappointed in them. They are worthless for eating. I think it very likely that the muddy bottom of the pond causes the fish to be so indifferent for eating. — E. F. RAWORTH, *Vicksburg, Miss.*

204. TOUGH AND UNFIT TO EAT. — Our country is getting pretty thoroughly stocked with German carp, and there is hardly a paper in the land but teems with praises of their wonderful growth, loveliness, adaptability to the shallow ponds, &c., all of which we most unqualifiedly indorse; but how seldom do we hear one word as to their eating qualities. Although our esteemed senator from this district, who introduced them here three years ago, tells us they sell "side by side" with the best fish in the Washington, D. C., market, still that does not keep other Kentuckians, at least, from having their tastes. From fifteen to twenty families around here have tried them at different times during the past year, and, except two persons who could eat them but did n't relish them, they unhesitatingly pronounced them unfit to eat. They have tried them boiled, baked, and fried, and discarded them every way. One lady says, they are well named leather carp, for we would prefer leather served in any style, to them; and, right here, might not our fish commissioners have mistaken their use, and ought we not to send a few to the tannery? Another person says he intends to keep raising them, for he knows they will prove valuable for soap grease. Such are some of their indorsements here, and we would like for others throughout the country not to think so much of them as we did, having them nearly three years before trying them, but to try them as soon as possible, and report the results. — *An anonymous Kentucky correspondent of the American Field, January 20, 1883.*

#### VI. — A FEW OPINIONS IN REGARD TO THE BONES.

205. VERY FREE FROM BONES. — Very much like Lake Michigan white-fish; bony at the back of the head, like shad. The remainder is very free from bones. — E. MILLER, *Mahwah, N. J.*

206. VERY FEW BONES. — Fried, it was very good; very few bones. — T. HOLT, *Holt's Summit, Mo.*

207. FINE FLAVOR, NO BONES, AND FAT. — Yes; dam broke, and those injured in catching were baked and fried. They were of fine flavor, fat, and no bones. — ED. M. GRESHAM, *Carlton's Store, Va.*

208. GOOD BUT BONY. — Yes; a good number fried and boiled. They are pronounced by all as good as any fish, excepting a few more bones than we usually find in other fish. — M. S. O'NEAL and C. G. ARNOLD, *Versailles, Ky.*

209. BONY, LIKE BUFFALO. — I dissected two or three and I found those detached bones that make the buffalo (Western Cyprinidæ) thick-lip so objectionable. Otherwise it is a good fish in August and September. After that they get soft, and continue to be so till after they have spawned in June. — E. Z. BUTCHER, *Solomon City, Kan.*

210. BONES IN SMALL ONES. — Yes. Fine baking fish. Small ones are rather too bony for frying, perhaps. — E. A. LINDSEY, *Jackson, Tenn.*

211. NOT FULL OF BONES NOR MUDDY. — Carp are not full of bones and do not taste of mud, as some would have us think, but, on the contrary, are very free from small bones and are a most excellent table fish, to which several who have dined with me will testify. — H. B. DAVIS, *Macon, Ga.*

#### VII. — HINTS UPON VARIOUS WAYS OF COOKING CARP BY OTHER ADMIRERS OF THIS FISH.

212. FRIED BROWN: FIRST RATE. — Yes; we have tried them three times. We scald them the same as catfish, roll them in meal, and fry them brown. We think they are first rate; good as we want. — A. J. and W. B. BAIRD, *Nashville, Tenn.*

213. SALTED TO REMOVE MUDDY TASTE; THEN FRIED. — They tasted of mud unless they were first soaked in salt water over night. Then fried they were very good. — Capt. JOHN T. FLETCHALL, *Poolesville, Md.*

214. SALTED AND FRIED BROWN: EXCELLENT. — We took one out of pond No. 2, in May, 1883, weighing three pounds. When scaled, salted five hours, floured, and fried brown, it was of excellent flavor. — J. W. LONG, *Mount Morris, Pa.*

215. FRIED BROWN: VERY SUPERIOR. — I have eaten one. I pronounce it splendid. It is a very superior fish when well cooked and fried brown, as a fish ought to be. — EDWARD THOMPSON, *Saint Johnland, N. Y.*

216. BEST WHEN FRIED BROWN. — Some 25 or 30 persons in this

vicinity have eaten them and generally pronounced them good enough. I ate two that were boiled and did not like them so well as fried and well browned. They are drier and suit my taste better. — W. E. LOGAN, *Andrews, Ohio*.

217. SPLIT AND FRIED: EXCELLENT. — We have tasted of the large size, and of the largest size of young ones. We had them fried. The large size were split before frying, and pronounced by my family and friends that helped to eat them excellent. — BENJAMIN G. CISSEL, *Highland, Md.*

218. SPLIT AND FRIED: NEVER ATE BETTER. — I have. The 1 to 2 pounds carp were split open and fried, and the opinion of every one is that they never ate better fish. Mine are of the scaly variety. — P. G. POWELL, *Versailles, Ky.*

219. FRIED IN BUTTER: NICE. — We have eaten one; cleaned it in the evening, salted it, and fried it in butter; thought it good and nice. — WM. SADLER, *New Salem, W. Va.*

220. FRIED IN BUTTER AND LARD. — Of the very finest. One, which was rolled in wheat flour and fried in butter and lard. Their eatable qualities were of the very finest. — BENJAMIN L. GARBER, *Marietta, Pa.*

221. FRIED IN LARD: EXCEEDINGLY GOOD. — Last October we ate two of the smaller ones. They were fried in lard, as fresh fish are often cooked, and all who tasted them pronounced them exceedingly good. — DAVID SCOTT, *Elkton, Md.*

222. FRIED IN LARD AND OIL. — Yes, sir; fried in lard and cotton-seed oil; we prefer the oil. We think they are a very fine fish and very sweet. — E. B. PLUNKET, *Atlanta, Ga.*

223. SLICED AND FRIED WITH EGGS AND CRUMBS. — The only one eaten was cut into steaks, dipped into egg and bread crumbs, and fried. The quality was good. — JOHN PICKERING, *Fontana, Kans.*

224. FRIED AND BOILED: GOOD. — We have eaten and presented to our neighbors about 100, and all regard their edible quality good. We fry them and boil them same as rock fish. — JOHN S. DALLAM, *Bel Air, Md.*

225. BROILED: FIRST RATE. — Yes; broiled, with butter and pepper, they are first rate. — SAMUEL T. EARLE, *Centreville, Md.*

226. BROILED WITH LEMON SAUCE: DELICIOUS. — Yes; broiled, with lemon sauce, and baked, they are delicious. — P. H. COLEMAN, *Union Springs, Ala.*

227. BAKED OR FRIED. — Last fall we ate two mirror carp, and the 7th of August, 1883, two weighing 4 pounds and one ounce. One was stuffed and roasted, the other fried. A. Stout, Dr. Terry, S. Sharp, John Bidger, and others join me in saying they are the

best they ever tasted. About twenty persons tried them on my fifty-sixth birthday. — Dr. SETH G. BIGELOW, *Silver Lake, Ind.*

228. SKIN, AND FRY OR BAKE THEM. — We first skin them, then thoroughly scald them and either fry or bake them. — O. A. GILMAN, *Paris, Ky.*

229. EATS THEM VARIOUS WAYS. — I have eaten them abroad in various styles of cooking, but have eaten none of mine. — DANIEL C. BIRDSALL, *Westport, Conn.*

230. ALL WAYS: VERY EDIBLE: SCALE CARP BEST. — I have eaten quite a number fried, baked, stewed, and boiled. When properly prepared they are very edible. — SAMUEL M. SUBERS, *Macon, Ga.*

231. ALL WAYS: EQUAL TO SHAD. — Baked, boiled, stuffed, fried, served on rice, eggs, toast, etc., they are equal to shad. — ABEL A. WRIGHT, *Griffin, Ga.*

232. ALL WAYS, BUT LARGE ONES ARE BEST BOILED. — Yes; boiled, baked and fried. They are best boiled when large. — BENJAMIN D. PALMER, *Sandy Springs, Md.*

233. PREFERS THEM BOILED. — Have been eating them all summer, broiled, fried and boiled. Boiled is thought the best with us and by others that have eaten them. — Capt. E. HERMAN, jr., *Towson, Md.*

234. BOILED LIKE ROCK: GOOD. — Yes; fried and boiled. The larger carp boiled and served as rock are served is palatable and good. — ROBERT E. WITHERS, *Wytheville, Va.*

235. A GERMAN METHOD. — It was with no common pleasure that we were called on to witness the preparations for an original and savory meal, which the forester of Max von dem Borne [of Berneuchen, Germany] cooked with consummate skill, closely following the method employed by the North American trappers and sportsmen during their camp-life in the vast forests of the Western Hemisphere. Four plump carp were cleaned, washed, well strewed with salt and pepper both on the inside and the outside, and thereupon wrapped — each one separately — in a white sheet of paper well buttered. Round this a sheet of newspaper was wrapped, the package was for a few moments dipped in cold water, and finally placed on a bed of hot coals of an open fire. Above the four carp came a layer of raw potatoes, which were thus baked in the ashes. In about half an hour the “pepper carps” were ready for the table. Full of their own juice, they formed a most tempting and delicious dish, and being handed round, together with potatoes, on large napkins, satisfied even the most epicurean taste. [From the *Magdeburgische Zeitung*, No. 501, Magdeburg, October 27, 1881.]

236. GERMAN METHOD OF COOKING. — Yes; many a one in Germany. When young, say 2 to 3 pounds, they will do to fry; but when they weigh 10 to 50 pounds they are generally stewed in water first, afterwards in a gravy made of brown bread, a small portion of sugar or of molasses is added, and then they put in enough of brown beer to make gravy sufficient to cover the fish and also according to the size of the family. — LEO WELTZ, *Wil-mington, Ohio*.

237. BOILED IN BEER: DELICIOUS. — Yes, sir; they were boiled in beer after the Saxon fashion (not lager beer, however, but what is called common beer). They were delicious. — HUGO MULERTT, *Cincinnati, Ohio*.

238. WINE METHOD OF COOKING. — I have eaten carp and find them good. One specimen of 5 pounds and two years old, taken from a pond on Long Island, was cooked as follows: First boiled in white wine for 15 minutes and then baked in an oven and served with a white-wine sauce. It was eaten by a number of epicures, and by all pronounced a fine table-fish. — EUGENE G. BLACKFORD, *Fulton Market, New York, N. Y.*

239. PARTLY BOILED AND PARTLY BAKED: FIT FOR A KING. — I always instruct the cook to clean them nicely; then wrap the fish in a linen towel, have a large kettle of water boiling, coil the fish neatly in the kettle and boil fifteen minutes, then turn off the water, remove to a baking pan without marring and put in the oven, bake and then baste with butter gravy. A nice dressing could occupy the interior of the fish and the space around the sides. If properly done it makes a dish fit for a king or a hungry fisherman, — W. VAN ANTWERP, *Mount Sterling, Montgomery County, Ky., Oct. 31, 1882*.

240. SKINNED, DIPPED, AND FRIED: EXCELLENT, — The carp we caught from our pond last September to eat were skinned when dressed, cut into pieces of suitable size, dipped in flour, and fried. It was excellent. — GUSTIN HAVENS, *Lewis Centre, Ohio*.

241. BOILED: BUTTER GRAVY: RESEMBLED LOBSTER. — I ate but one carp, which was boiled and served with a butter gravy. A friend, who was taking dinner with me, as well as myself, pronounced it "very good indeed," although different from any other fish, with a faint resemblance to lobster in taste. It is, however, not impossible that we both were prejudiced in favor of carp. — A. RAHT, *South Cottonwood, Salt Lake County, Utah, Feb. 9, 1883*.

242. AN EXCELLENT RECEIPT FOR FRYING CARP. — Be sure to clean the fish thoroughly. Remove the fat from the inside. Place



the fish in a weak brine over night. Wipe it thoroughly dry and cover it with flour or meal, Have the fat boiling hot and do not put the fish in until it is boiling. Fry quickly, and brown as you like to have it. — Prof. E. T. Cox, *New Harmony, Ind.*

## THE GERMAN CARP AND ITS INTRODUCTION IN THE UNITED STATES.

BY CHAS. W. SMILEY.

[A paper read before the American Association for the Advancement of Science, at the Minneapolis meeting, 1883.]

1. SYSTEMATIC POSITION, VARIETIES, AND ECONOMIC RELATIONS. — The German carp belongs to the family *Cyprinidæ*, and genus *Cyprinus*. Of the *Cyprinus carpio* there are three varieties: the scaled, which is the most edible; the leather, which is the most prolific; and the mirror, which is intermediate between the other two. The common gold fish, *Cyprinus auratus* Linnæus, is an allied species, with which the German carp very readily hybridizes.

The present purpose is not to speak of carp from a biological stand-point, but from an economic one, especially as there is little that is new with reference to its biology and much that is new when economically considered.

2. HISTORY OF ITS INTRODUCTION. — The carp was originally from Central Asia, whence it was introduced into Europe a few centuries ago: into England in 1504, and into Austria in 1227. It is alleged that Capt. Henry Robinson brought carp from Holland to the United States about 1830 and put them into his ponds at Newburg, N. Y., from whence they escaped into the Hudson.\* As nothing practical came of this, the real introduction of carp into the United States dates from May 26, 1877, at which date Mr. Rud. Hessel arrived from Bremen with 345 carp of different varieties for the United States Fish Commission.† These were propagated under the direction of Prof. S. F. Baird. The distribution of their young commenced in the fall of 1879, and has continued to the present time in increasing quantities annually. The number distributed in 1879 was 6,203 to 273 applicants in 24 different States of the Union. In 1880, 31,443 were distributed to 1,374

\* See Bulletin of the United States Fish Commission, 1882, page 25.

† Report of United States Fish Commissioner for 1877, page 43.

different applicants in 34 different States and Territories. During the past season 113,605 have been distributed in lots of from 15 to 20 to each applicant.

3. **NATURAL HISTORY.** — The carp prefers a pond containing warm water and muddy bottom, but neither of these are absolutely essential. It feeds upon such worms and lower forms of animal life as are within its reach, but never upon other fishes. It will, however, eat its own eggs if forced to by hunger. It is very fond of vegetable food, such as lettuce, cabbage, leaves of various water plants, seeds, grain, meal, bread, crackers, corn-bread, &c. Most anything you would give to chickens you can give to carp to eat.

If the water is warm, the summer long, and there be plenty of food, either natural or artificial, the growth of the carp will be surprisingly rapid. There are well authenticated reports of it reaching 3 pounds in one year and 6 pounds in two years. If no artificial food is furnished, and there is also a scarcity of natural food, or if the climate be cold, the growth will be much less rapid. Indeed, when the water becomes quite cold it will partially bury itself in mud and lie in a dormant state through the entire winter and until spring fairly sets in. In the southern part of Texas it is probable that the carp will not be forced to hibernate at all except in case of an unusually severe winter. In the northern parts of Maine and Minnesota it may be expected to hibernate nearly half the year. As it cannot grow during its hibernation, it is easy to see why so much more rapid growth is obtained in Texas than in Vermont. There is little danger, however, of its freezing to death, for carp have survived in tubs of water over which a thick film of ice has accumulated.

Carp usually spawn in cool latitudes the third year, in temperate latitudes the second year, and there are well authenticated instances of its having spawned in Southern Texas at the age of one year. These cases, however, are where carp are supplied with an abundance of food, well cared for, and protected from their numerous enemies.

The enemies of carp are legion, and in many cases exterminate the fish. Not only do all kinds of carnivorous fish prey upon its young, but nearly all kinds of fish will eat its eggs. Frogs, snakes and turtles will eat both eggs and young in numerous quantities. A snake was recently killed at the carp ponds in Washington in which was found over 25 young carp and numerous undigested skeletons of the same fish. One medium size snake, if furnished the proper facilities, can be depended upon to eat forty carp per day, one thousand per month, or five thousand each summer. Divide your number of young carp by this figure and you can find

out how many snakes it will require to exterminate your young. Various birds, such as kingfishers, bitterns, cranes, herons and fish-hawks understand catching carp much better than the average farmer. About the 17th of July last a marsh hen was shot at the Washington carp ponds whose stomach contained 38 young carp, and a night heron whose stomach contained the heads of 78 young carp. In many cases where the carp have been left to the mercies of these enemies they have succumbed. The only proper method is to furnish protection to the carp until they reach such an age as to be well able to cope with these enemies. It is therefore best to separate the spawning carp from all other animals, and carefully protect the eggs of the young for as long a time as convenient.

In regard to the food qualities of carp, it ranks somewhat above the ordinary native fish, such as buffalo, mullet, suckers, mud-fish, croakers, mill-roach, perch, sunfish, &c., but it is hardly equal to the high-priced delicate class of fish which includes the bass, trout and shad. And yet many persons who are cultivating carp declare them equal to any fish they ever tasted. If carp are grown in muddy or polluted water their flesh, like that of any other animal, will be impregnated thereby. But the carp may be removed to pure water for a week, during which the system will be purified, and at the end of which even these will be good eating. Some have alleged that salting such over night will greatly improve the flavor. During and immediately after the spawning season adult carp, like all other fish, become soft and unfit to eat. Some persons have ignorantly tasted of them at this season, and have therefrom very unjustly condemned them. Carp contain bones, of course, but in the adult the flesh flakes off from the bones very nicely. Even in the small ones the bones are no more objectionable than in the average fish.

4. THE METHOD OF DISTRIBUTION. — Several breeding ponds have been fitted up at Washington from the so-called Babcock lakes and from extensions into the Potomac marshes. These will present a very picturesque appearance, in addition to their usefulness, after the reclamation of the Potomac flats. These ponds are constantly watched by their superintendent, Mr. Rud. Hessel and his assistants, who have abundant facilities for destroying enemies, draining the ponds, supplying fresh water, food, &c. At the proper season, which extends from October 15 to January or February, the young are sent out by one of two methods: first, they are put in five and ten gallon cans of water and loaded in the cars of the Fish Commission, of which there are two fitted up with suitable appliances for carrying all kinds of fish. These cars, which present an outward appearance of parlor cars, are dis-

patched on passenger trains to central points in all the different States of the Union, where instalments may be delivered to State fish commissioners or the carp treated by the second method. Second, a quart pail containing a pint of water and 15 to 20 carp can be sent by express to any distance which will not require more than 36 to 48 hours, or even further, if the water can be changed meantime, always provided that water enough remains in the pail to cover the backs of the fish. Most of the States of the Union have appointed State commissioners, who receive installments from the United States Fish Commission and distribute them to applicants within their jurisdiction. Many of them have also established propagating ponds, in which they are already producing young by the thousands and tens of thousands. Some private speculators have received carp from the United States Fish Commission, reared young, and are now selling them at speculative rates. The price list of one of these gentlemen states that he will sell mirror carp ten months old at \$75 per hundred, scale carp ten months old, at \$70 per hundred. Large fish are even sold at five dollars a pair and would perhaps be sold at higher rates were it not for the fact that the United States Fish Commission furnishes its small fish free of cost. The express charges constitute the only expense to the recipient.

5. **ECONOMIC RESULTS.**—The cultivation of fish is destined to become as important among American farmers and planters as the cultivation of cattle, sheep, swine, poultry, or of grains, fruits, and berries. They have long since ceased to leave the latter to shift for themselves and to cope with their enemies, knowing that in such a struggle live stock, grains, and fruits come off second best or succumb. Fish should receive the same care and attention, both as to improving varieties, artificial propagation and growth. The practice which farmers will obtain in carp culture will probably open the way to the successful culture of various other kinds of fish. The hardiness and wide range of diet and the rapid growth of carp especially fit it to be the precursor in fish farming. Every rural community is destined to have its fish ponds in the same abundance that it has its pig pens or its poultry yards. This will enable every farmer, however remote from market, to introduce fresh fish into his bill of fare at a very trifling cost. The carp may be made a pleasurable pet, learning to come to its food at call, if habitually fed in one place, and in shallow water, or upon a plank submerged a few inches. From these places, by reason of its tameness, it can be taken even with the hands. Finally, there is no more tasteful and economic means of decorating a plantation or a country seat than by a carp pond neatly prepared and protected. If, however,

any persons should imagine that these good results are to be attained merely by filing an application for carp and upon the receipt of the fish leaving them to shift for themselves, and unaided to cope with their enemies, it is well that their minds be disabused at the first, for there is no provision of nature anywhere whereby a man shall obtain his daily bread except by the sweat of his brow.

UNITED STATES FISH COMMISSION, August 21, 1883.

[F.]

## LEGISLATION.

[CHAP. 31.]

AN ACT relative to Fishing in the Merrimack River.

*Be it enacted, etc., as follows:*

For the purpose of taking fish called "shiners" for bait, any person may draw a net or seine during the months of November and December at any point in the Merrimack River, except within four hundred yards of any fishway; *provided*, that all other fish so caught are immediately returned to the waters from which they were taken; and the penalties provided for in sections thirty-six, thirty-seven, thirty-eight and thirty-nine of chapter ninety-one of the Public Statutes shall not apply to the taking of fish as herein provided. [Approved March 6, 1883.]

[CHAP. 76.]

AN ACT in addition to An Act to regulate the taking of Fish in North River in the county of Plymouth.

*Be it enacted, etc., as follows:*

SECT. 1. Whoever sets a seine or casts a mesh net in the North River in Plymouth County, or whoever by seine or mesh net takes any fish from said North River, except such persons as have authority so to do under chapter forty-four of the acts of the year eighteen hundred and eighty-one, shall be punished for each offence by a fine not less than equal twenty-five dollars nor more than one hundred dollars, or by imprisonment in the house of correction not less than one nor more than three months.

SECT. 2. Section four of chapter forty-four of the acts of the year eighteen hundred and eighty-one is hereby amended by inserting after the word "fish," in the second line, the words "from two o'clock in the morning until sunset." [Approved March 24, 1883.]

## [CHAP. 121.]

AN ACT to authorize the Commissioners on Inland Fisheries to issue permits for Fishing in the Merrimack River.

*Be it enacted, etc., as follows:*

SECT. 1. The commissioners on inland fisheries may issue permits for the taking of any variety of fish in the tidal waters of the Merrimack River and its tributaries, the taking of which is now in any way prohibited by law. Such permits shall be revocable at the discretion of said commissioners, and no fee or consideration shall be charged for the issuing of the same.

SECT. 2. This act shall take effect upon its passage. [*Approved April 11, 1883.*]

## [CHAP. 180.]

AN ACT to regulate the taking of Fish in Acushnet River in the town of Acushnet.

*Be it enacted, etc., as follows:*

SECT. 1. The town of Acushnet may at any legal meeting called for that purpose make regulations, not inconsistent with the provisions of the laws of the Commonwealth, concerning the taking of herrings, alewives and shad within said town, or concerning the disposal of the privilege of taking the same for its own use and benefit.

SECT. 2. Said town may, at its annual meeting in April in the year eighteen hundred and eighty-three, and in each year thereafter, choose three discreet persons by ballot whose duty it shall be to inspect said river, to cause the regulations respecting said fishery to be carried into effect and to prosecute all violations thereof.

SECT. 3. Whoever takes from said river any of said fish in violation of said regulations shall forfeit for each fish so taken not more than ten dollars nor less than one dollar, one half of all such forfeitures shall enure to the complainant and one half to said town.

SECT. 4. The powers and duties granted by this chapter shall be subject in all respects to the rights heretofore granted to the city of New Bedford under chapter one hundred and sixty-three of the acts of the year eighteen hundred and sixty-three, and nothing contained in this act shall in any way be construed as permitting or authorizing any interference with the water supply of said city, or authorizing any control in or in any way applying to the storing reservoir of said city or any works connected with its water supply, nor shall any such fishery be permitted to be operated in said reservoir or in any portion of said water supply.

SECT. 5. This act shall take effect upon its passage. [*Approved May 16, 1883.*]

[G.]

## LIST OF PONDS LEASED

*By the Commissioners on Inland Fisheries, under Authority given by Chap. 384, Sect. 9, of the Acts of 1869.\**

---

**1870.**

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.  
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.  
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.  
Oct. 15. Archer's Pond, in Wrentham, to William E. George, 15 years.

**1871.**

- Jan. 10. Nine-Mile Pond, in Wilbraham, to B. F. Bowles, 10 years.  
30. Little Pond, in Falmouth, to F. H. Dimmick, 10 years.  
April -. Spectacle, Triangle, and Peters ponds, in Sandwich, to G. L. Fessenden and another, 5 years.  
17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.  
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 year .  
18. Little Sandy Pond, in Plymouth, to William E. Perkins, 15 years.  
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

\* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the 1st of October, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.



**1872.**

- Jan.** 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.
- July** 20. Little Pond, in Braintree, to Eben Denton and others, 20 years.

**1873.**

- May** 1. Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.
1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July** 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept.** 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct.** 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Nov.** 1. Lake Chaubunagungamong, or Big Pond, in Webster, to inhabitants of Webster, 5 years.
- Dec.** 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

**1874.**

- Mar.** 1. Walden and White Ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April** 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk Ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May** 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fulam, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July** 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.

## 1874.

- July 11. Hazard's Pond, in Russell, to N. D. Parks and others, 20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Middleton, 15 years.

## 1875.

- Jan. 1. White and Goose Ponds, in Chatham, to George W. Davis, 15 years.
- Mar. 1. Lake Pleasant, in Montague, to inhabitants of Montague, 10 years.
1. Hood's Pond, in Ipswich and Topsfield, to inhabitants of Topsfield, 15 years.
- April 1. Chauncey Pond, in Westborough, to inhabitants of Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others, 15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others, 15 years.
24. Pleasant Pond, in Wenham, to inhabitants of Wenham, 15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15 years.
1. Great Pond, in North Andover, to Eben Sutton and others, 20 years.
1. Chilmark Pond, in Chilmark, to J. Nickerson and others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to inhabitants of Winchester, 15 years.
1. Haggett's Pond, in Andover, to inhabitants of Andover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others, 20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of Sterling, 20 years.
9. Mystic (Upper) Pond, in Winchester, Medford, and Arlington, to inhabitants of Winchester and Medford, 15 years.
- Oct. 1. Little Chauncey and Solomon ponds, in Northborough, to inhabitants of Northborough, 15 years.

## 1876.

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel Thrasher and others, 15 years.

**1876.**

- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth, 15 years.
1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.
- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years,
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. Whitney's Pond, Wrentham, to inhabitants of Wrentham, 15 years.
1. Little Pond, in Barnstable, to George H. Davis, 15 years.

**1877.**

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
15. Pentucket and Rock ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
- Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
- Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
1. Battacook Pond, in Groton, to George S. Graves and others, 15 years.
- Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.
1. Asnebumskitt Pond, in Paxton, to Ledyard Bill and others, 15 years.

**1878.**

- Jan. 1. Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
- Mar. 16. Asnaconcomie Pond, in Hubbardston, to Amory Jewett, jun., 15 years.
- April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.

**1878.**

- May 5. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.
1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
- July 1. Lake Buell, in Monterey and New Marlborough, to Andrew L. Hubbell and others, 5 years.
- Oct. 1. Eel Pond, in Melrose, to J. A. Barrett and others, 15 years.
1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.

**1879.**

- Feb. 1. Lake Mahkunac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
- June 1. "Bald Pate," "Four Mile," and "Stiles" ponds, in Boxford, to inhabitants of Boxford, 10 years.
- July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
- Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
- Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

**1880.**

- Jan. 1. Granite-Cove Pond, in Gloucester, to David Babson, 10 years.
- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
- May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.

**1880.**

- Dec. 24. Chadwick's Pond, in Bradford and Boxford, to town of Bradford, 10 years.

**1881.**

- Jan. 1. Great and Job's Neck ponds, in Edgartown, to Amos Smith and others, 15 years.  
Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.  
May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bul-  
lard and others, 15 years.  
April 1. Long Pond, in Blandford, to Samuel A. Bartholomew  
and another, 15 years.

**1882.**

- Mar. 1. Blair's Pond, in Blandford, to Curtis M. Blair and  
another, 15 years.  
April 1. Ward Pond, alias Wightman Pond, in Ashburnham, to  
Herbert F. Rockwood and another, 15 years.  
May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15  
years.  
June 1. Wickaboag Pond, in West Brookfield, to inhabitants of  
West Brookfield, 15 years.  
Oct. 1. Long and Hummock ponds, in Nantucket, to Charles  
E. Snow and others, 15 years.

**1883.**

- Mar. 1. Halfway Pond, in Plymouth, taken by Commissioners  
for 5 years, in accordance with provisions of Chap.  
62, Acts of 1876.  
April 6. Fresh Pond, in Tisbury, to Allen Look and others, 15  
years.  
April 23. Keyes Pond, in Westford, to M. H. A. Evans, 15  
years.  
May 7. Singletary Pond, in Sutton and Millbury, to towns  
of Sutton and Millbury, 15 years.  
May 7. The Great Pond, in Ashfield, to town of Ashfield, 15  
years.

## [H.]

## EXTRACTS FROM RETURNS ON PONDS.

## EEL POND, MELROSE.

13 black bass, weight,	. . . . .	24 $\frac{1}{2}$ lbs.
206 pickerel,	" . . . . .	181 $\frac{1}{2}$ "
320 perch,	" . . . . .	92 $\frac{1}{2}$ "
29 pouts,	. . . . .	
13 eels,	. . . . .	

HENRY A. BUSH.

## SANDY POND, LINCOLN.

Black bass slowly increasing each year. The number of fish taken from the pond cannot be given with accuracy, but persons skilled in black-bass fishing have had some good days' fishing when they took from 6 to 25 good-sized fish. As a rule they are not taken in great numbers by any one.

I estimate the number taken from the pond during the year at not more than 500, weighing perhaps 1,000 pounds.

JAMES L. CHAPIN.

## DENNISON POND, WINCHENDON.

The Fish Committee of the town of Winchendon would report that so far as they can judge from observations made and the fish known to have been taken, that the stocking of this pond is a success. Of the land-locked salmon obtained from the State four or five years ago, some have been taken of from  $\frac{3}{4}$  of a pound to  $1\frac{1}{2}$  pounds in weight, each: those of less than one pound being returned to the lake. Enough were seen to warrant the belief that the salmon are doing well and are getting in a condition and of an age to propagate and keep their numbers good. The land-locked salmon and trout fry furnished us last spring by the Commission, were all put into the waters in good condition and without loss. A few black bass have been taken, some weighing two and three

pounds and over, which shows that of those put in, some have lived and flourished and will be heard from more in the near future.

The State Commissioners have our thanks for the very liberal supply of fry given us for stocking purposes.

E. S. MERRILL.

#### HAZARD POND, RUSSELL.

The stocking of this pond with black bass has been a great success. During the past year the pond has been increased in depth and acreage by a dam, which, of itself, has very much benefited and assisted in raising fish. At present we have large numbers of black bass and pickerel, the latter being in the pond when it was leased. Of the land-locked salmon I can only say that they have entirely disappeared — not having been seen for two or three years. During the past season a large number of fish have been taken from the pond. For many years after the pond was stocked with bass, it was closed and when it was opened to fishing we found the fish poor and of little use. Now, however, it is different; they have increased largely in numbers and improved in quality. In fact I never saw fatter or finer quality of fish in my life. We feel much gratified at the results attained in stocking Hazard Pond. Any particulars you may desire in relation to this matter I shall be pleased to furnish.

WESTFIELD.

W. H. FOOTE

#### CRYSTAL LAKE, WAKEFIELD.

111 black bass, weight,	.	.	.	.	.	144½ lbs.
309 pickerel, " . . . . .	.	.	.	.	.	238 "
1,750 yellow perch, . . . . .	.	.	.	.	.	
32 white perch, . . . . .	.	.	.	.	.	
600 pouts, . . . . .	.	.	.	.	.	
40 bream, . . . . .	.	.	.	.	.	
5 eels, . . . . .	.	.	.	.	.	

LYMAN H. TASKER.

#### MASSAPOAG POND, SHARON.

There were issued to inhabitants of this town 263 permits. Estimated weight of fish caught 1,315 pounds, fully one-third of which was black bass, the remainder perch and pout. The bass have been on the average larger than previously.

HENRY A. BOYDEN.

## PONDS IN ROCHESTER.

215 black bass, average weight, . . . . .	2 lbs.
813 pickerel, . . . . .	—
150 white perch, . . . . .	—
375 red “ . . . . .	—

GEO. WELD.

## LITTLE SANDY POND, PEMBROKE.

Black bass, . . . . .	100
Pickrel, . . . . .	56

This represents but a small part of the bass caught, all under 2 pounds being returned alive.

A. C. BRIGHAM.

## MORSE'S POND, NEEDHAM.

Black bass, . . . . .	75 lbs.
Pickrel, . . . . .	175 “
Perch, . . . . .	134 “
Pout, . . . . .	80 “

EDMUND M. WOOD.

## LEARNED'S AND FARM PONDS, FRAMINGHAM.

The stocking of Learned's Pond with black bass has proved a success. The number as well as the size of fish taken was large, from 4 to 6 pounds being common. Farm Pond, which is a storage-basin for Sudbury River water, was stocked with Plymouth white perch, — also a perfect success. A considerable number have been taken the present year and acknowledged the best fish taken from our waters. The land-locked salmon seem a failure, as we have never seen one of any size, nor heard of any being taken.

CHAS. W. COOLIDGE.

## HOCKOMOCKO POND, WESTBOROUGH.

58 black bass, weight, . . . . .	133 lbs.
130 pickerel, “ . . . . .	148 “

Nothing to report with regard to land-locked salmon, as nothing has been seen of them since they were put in the pond.

GEO. O. BRIGHAM.



## INDIAN POND, KINGSTON.

Black bass,	.	.	.	.	.	.	.	.	21
Pickarel,	.	.	.	.	.	.	.	.	154
Perch,	.	.	.	.	.	.	.	.	279

JOHN F. HOLMES.

## TISBURY GREAT POND, TISBURY AND CHILMARK.

White perch,	.	.	.	.	.	.	.	.	5,800
Alewives,	.	.	.	.	.	.	.	.	89,731
Striped bass,	.	.	.	.	.	.	.	.	8
Smelts,	.	.	.	.	.	.	.	.	126,800
Tautog,	.	.	.	.	.	.	.	.	57

ALLEN LOOK.

## GREAT AND JOB'S NECK PONDS, EDGARTOWN.

White perch,	.	.	.	.	.	.	.	.	15,066
Alewives,	.	.	.	.	.	.	.	.	72,591
Smelts,	.	.	.	.	.	.	.	.	25,955
Eels,	.	.	.	.	.	.	.	.	6,000

AMOS SMITH.

## CHILMARK POND, CHILMARK.

Alewives,	.	.	.	.	.	.	.	.	19,399
-----------	---	---	---	---	---	---	---	---	--------

JOHN W. MAYHEW.

## OYSTER POND, EDGARTOWN.

Perch,	.	.	.	.	.	.	.	.	23,560
Smelts,	.	.	.	.	.	.	.	.	65,728
Alewives,	.	.	.	.	.	.	.	.	15,798
Tautog,	.	.	.	.	.	.	.	.	558
Eels,	.	.	.	.	.	.	.	.	2,312

JOPHANUS H. SMITH.

ANDOVER, Dec. 6, 1883.

*To the Commissioners of Inland Fisheries:*

On behalf of the lessees of Haggett's Pond and Pomp's Pond, in Andover, we would respectfully report, that fishing has been allowed in Haggett's Pond on thirteen days during the past season. While no accurate account of the catch was kept, or was practicable, the number of black bass taken was apparently in excess of the number in any former year save the first, and indications of a steady increase of these fish in the pond are marked.

Several thousand fry of the Lake Superior salmon trout furnished by your board, placed in the pond last spring without loss of a single one in transit.

Under license from your board, some 25 or 27 bass were taken from Haggett's Pond, out of season, and placed in Pomp's Pond. They varied in weight from a few ounces to three pounds, and are believed to be sufficient in number to stock successfully this small pond.

Respectfully submitted.

INHABITANTS OF ANDOVER, *Lessees.*

By GEO. H. POOR, *of their Fish Com.*

HUNTINGTON, MASS., Dec. 8, 1883.

E. A. BRACKETT, Esq., *Commissioner of Inland Fisheries:*

DEAR SIR, — One hundred and nine fishing permits have been issued for fishing in Norwich Pond during the present year to residents of Huntington and non-resident tax-payers therein, and seventy-five fishing permits have been issued to non-residents who are not tax-payers in said town. As the fishing permits, which call for the number and weight of fish caught, have not generally been filled out, we are not able to report definitely in regard to those matters, but estimate as follows: 75 black bass, weighing 125 pounds; 150 pickerel, weighing 250 pounds; 3,500 perch, weighing 700 pounds; 300 bull-heads, weighing 100 pounds; 25 eels, weighing 30 pounds; and 75 suckers, weighing 40 pounds. No land-locked salmon have been taken from the pond.

The income from the pond for the fishing year, beginning May 15 and ending October 15, 1883, was thirteen  $\frac{71}{100}$  dollars,\* and the pond keeper's fees were six  $\frac{85}{100}$  dollars, leaving the net income six  $\frac{86}{100}$  dollars.

Submitted with respect.

SCHUYLER CLARK,

AUSTIN REEDE,

LEWIS A. CLARK,

*Fish Committee of Huntington.*

MILLBURY, MASS., Dec. 19, 1883.

E. A. BRACKETT, Esq., *Commissioner of Inland Fisheries:*

DEAR SIR, — The inhabitants of the town of Millbury, lessees of Dimity Pond, for the purpose of cultivating useful fishes, by their selectmen, would respectfully submit the following report.

The pond was stocked with black bass in 1878-9, through the liberality of Chas. W. Seabury, Esq., a citizen of the town.

\* Probably from permits to non-residents.

The present season, ending Dec. 1, 1883, is the first that fishing has been allowed in the pond since it was stocked.

Permits for fishing have been issued to 791 persons, citizens of the town. These permits were returnable Dec. 1st, but at this date only 72 have been returned, say 9 per cent. This report will therefore be necessarily incomplete, as it must be based upon so small a percentage of permits issued.

From the 72 permits returned, it appears that the 49 fishers have caught 5 black bass, weighing  $11\frac{1}{2}$  pounds; 132 pickerel, weighing  $175\frac{1}{2}$  pounds; 218 perch, weighing 92 pounds, and other fish, mostly horned pouts, 472, weighing 48 pounds, as will be seen from the following table:

KIND OF FISH.	Number.	Pounds.
Black bass, . . . . .	5	$11\frac{1}{2}$
Pickerel, . . . . .	132	$175\frac{1}{2}$
Perch, . . . . .	218	92
Other fish, . . . . .	472	48
Total, . . . . .	827	327

An estimate of the fish caught under the whole 791 permits issued, based upon the returns made by the above 72 holders of permits, would be as follows:—

*Return of Fishing in Dimity Pond, 1883. Permits issued, 791.*

KIND OF FISH.	Number.	Pounds.
Black bass, . . . . .	55	126
Pickerel, . . . . .	1,450	1,928
Perch, . . . . .	2,395	1,011
Other fish, . . . . .	5,185	527
Total, . . . . .	9,085	3,592

A fuller report will be sent to you hereafter.

Respectfully submitted.

S. N. ROGERS,

*For Board of Selectmen of Millbury.*



---

---

## TABLES.

---

---

[I.]—TABLE NO I.—POUNDS AND WEIRS. — Showing the Catch of each during 1883.

TOWN OR PLACE. F	PROPRIETOR.	Shad.	Sea Herring.	Alwives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Breastbone.	Tautog.	Flounders and Flatfish.	Rela.
Manchester,	John G. Heath,	31	43,010	-	2,689	24,383	-	1	-	39	-	21	40	-
"	Jones Bros.,	-	12,700	300	6,650	21,505	-	-	-	-	800	-	-	-
Hingham,	Thomas Weston,	-	-	1,975	-	-	-	-	-	-	-	-	-	20
Plymouth,	J. H. Newcomb & Co.,	-	-	-	8,185	35,770	-	-	-	-	-	-	-	-
Sandwich,	T. L. Mayo & Co.,	101	82,300	16,895	26,930	337,224	-	803	-	46	-	446	1,473	-
Barnstable,	W. F. Carney,	74	6,700	1,345	2,004,055	3	-	4	10	2,108	118	8	20	1
Dennis,	Anthony T. Chase,	33	-	6,700	-	77,585	-	272	-	-	-	59	-	-
"	Deep Water Weir Co.,	21	4,500	-	-	56,226	-	10	-	-	-	324	-	-
"	Crowell Weir Co.,	-	1,200	1,800	-	169,067	-	20	-	-	-	51	-	-
"	Nobacussett Fish Weir Co.,	3	-	-	-	120	-	2,512	458	-	-	21	-	-
"	Sears Bros.,	2	-	2,320	-	59,113	-	1	-	-	-	-	-	-
Brewster,	Freeman Atwood & Son,	72	-	32	-	5,775	-	819	60	1	-	157	-	2
"	John Bassett,	3	-	300	-	687	-	621	6	-	-	-	-	-
"	Parker & Ellis,	1	-	219	-	5,721	-	324	19	-	-	-	364	-
"	Neil Nelson,	49	32,300	29,910	-	93,628	-	-	-	-	-	159	-	-
"	Z. H. Rogers,	-	500	-	-	1,525	-	343	9	-	-	13	-	-
"	Jeremiah R. Wilson,	35	-	6,530	-	36,733	-	-	-	-	-	56	-	-

Wellfleet.	W. P. Doane, . . .	-	873,550	-	15,495	18,697	-	2,530	15	-	-	-	243	29,010
Truro, . . .	Atkins Hughes & Co., . . .	-	-	-	-	545,680	-	49	-	-	-	-	-	-
" . . .	P. L. Paine & Co., . . .	22	287,805	62,361	11,907	275,415	-	1,095	1	39	-	-	59	3,928
" . . .	N. K. Parsons, . . .	52	820,230	18,197	11,355	151,540	-	1,286	-	154	-	-	86	1,941
Provincetown, . . .	Solomon Bangs, . . .	-	590,200	-	6,800	1,331,278	-	-	6	-	-	-	-	1,305
" . . .	William Dyer, . . .	20	315,135	31,945	2,202	86,310	-	108	53	497,632	2,857	-	63	4,238
" . . .	Benjamin Lewis, . . .	73	76,180	-	-	53,170	-	-	-	-	-	-	154	9,233
" . . .	Isaac B. Lewis, . . .	2	-	1,800	-	426	-	29	6	-	-	-	-	5,363
" . . .	S. T. & L. Nickerson, . . .	-	4,920	11,344	-	432,118	10	568	152	200	-	-	264	164
" . . .	T. K. Paine, . . .	9	98,774	-	-	121,942	-	105	5	-	-	-	-	8,835
Eastham, . . .	I. H. Horton, . . .	-	1,900	-	-	66,700	-	3,500	-	-	-	-	-	-
" . . .	O. W. Horton, . . .	-	3,000	-	-	14,237	-	874	-	-	-	-	-	-
" . . .	N. M. Knowles, . . .	-	-	-	-	4,600	-	3,373	-	-	-	-	-	-
" . . .	W. H. Nickerson, . . .	-	-	-	-	13,299	-	4,797	-	-	-	-	-	-
" . . .	James Savage, . . .	-	-	-	-	54,654	-	3,793	-	-	-	-	-	-
" . . .	Phillip Smith, . . .	-	-	-	-	19,550	-	3,646	-	-	-	-	-	-
Orleans, . . .	Isaac Hopkins, . . .	-	-	-	-	-	-	1,615	-	-	-	-	-	-
" . . .	W. H. Hopkins Weir Co., . . .	5	16,534	525	-	33,375	-	2,253	2	-	-	-	72	4
" . . .	Robert E. Oliver, . . .	-	-	-	-	22,940	-	5,644	12	-	-	-	-	-
" . . .	A. L. Walker, . . .	-	25	-	-	19,000	-	2,054	-	-	-	-	111	-
Chatham, . . .	S. F. Bearse & Co., . . .	806	7,500*	-	-	82,611	209	-	-	-	-	-	-	-
" . . .	Czar Weir Co., . . .	653	341,700	38,300	20,001	77,610	-	99	-	2	1	-	-	2,185

\* Barrels.

TABLE No. 1. — POUNDS AND WEIRS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alwives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Bqueetague.	Tanog.	Flounders and Flatfish.	Kele.
Chatham, . . . . .	Andrew Harding & Co., . .	802	123,075	28,482	-	202,872	-	135	-	-	-	-	-	-
" . . . . .	Middletown Weir Co., . .	805	140,450	98,067	87,254	22,316	-	988	1	79	11	150	2,235	-
" . . . . .	Reed, Loveland & Co., . .	357	583,900	73,050	15,000	167,031	-	85	1	-	3	-	-	-
Harwich, . . . . .	J. D. Allen, . . . . .	177	15,000	8,842	3	3	-	-	-	-	-	-	489	4
" . . . . .	J. N. Eldredge, . . . . .	247	-	4,759	21,320	2,038	-	592	2	29,972	27	221	344	1
" . . . . .	D. F. Weeks & Co., . .	553	19,500	41,080	6,619	-	-	19	18	7	48	52	3,185	-
Hyannisport, . . . . .	T. F. Phinney, . . . . .	98	9,827	4,810	560,384	1	2	276	1	22,703	296	24	411	117
Falmouth, . . . . .	Reuben T. Handy, . . . .	12	1,060	17,000	131,058	208	-	198	3	8,616	182	2,702	511	-
" . . . . .	Prince M. Stuart, . . . . .	10	-	10,250	1	2,240	-	629	21	68,276	3,238	3,068	4,419	-
" . . . . .	Wood's Holl Weir Co., *. .	21	-	12,340	-	2,043	-	538	-	69,545	3,376	2,400	728	-
Mattapolesett, . . . . .	Alexander B. Bowman, . .	-	-	9,225	17,275	-	-	14	-	3,979	22	177	-	-
" . . . . .	Jerome B. Dunn, . . . . .	-	-	6,037	13,528	-	-	30	-	7,118	370	157	321	56
" . . . . .	Dunn & Nye, . . . . .	-	-	8,557	19,292	2	1	2	4	7,033	212	721	984	14
Gosnold, . . . . .	Charles C. Allen, . . . . .	2	-	2,650	11,000	615	3	270	-	113,930	9,479	160	7,219	-
" . . . . .	Charles C. Church, . . . .	1	-	-	202	25	-	62	3	98,980	3,492	267	2,225	-
" . . . . .	Lewis A. Edwards, . . . .	9	30	8,239	65,962	32	2	87	208	50,752	2,937	5	5,352	9
" . . . . .	C. C. Murphy, . . . . .	43	-	9,335	58,217	262	-	398	-	23,505	7,419	88	2,229	-





TABLE No. 1.— POUNDS AND WEIRS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Bels.
South Dartmouth, .	William C. Butts, .	28	-	16,752	15,425	-	3	200	24	9,730	4,598	658	1,547	-
"	Nicolas Priault, .	7	3,594	13	7,693	-	-	53	29	4,713	1,136	921	2,021	19
"	Jonas Travers, .	30	7,934	-	32,541	24	-	244	40	19,677	8,350	395	4,258	1
Chilmark, .	R. Flanders & Co., .	-	100	4,815	125	-	-	555	-	27,326	1,100	546	9,789	-
"	Hiram O. Poole, .	15	-	9,900	2,126	21	-	706	-	76,333	3,703	154	18,105	-
Tisbury, .	C. F. Cleveland, .	9	-	9,668	15,460	-	-	26	12	1,842	384	36	11,612	-
"	E. S. Cleveland, .	-	-	-	-	-	-	-	-	-	-	-	-	-
"	Obed S. Daggett, .	155	12,959	-	71,892	107	5	1,654	14	31,808	1,415	126	3,207	-
Nantucket, .	Washington I. Fisher, .	-	-	-	-	-	-	2,400	-	-	-	-	-	-
Total, . . . . .		5,994	339,116	1,250,263	4,048,022	4,756,490	246	60,182	2,876	1,843,583	92,671	35,841	184,387	5,361

TABLE NO. II. — SALT-WATER SEINES — Showing the Catch of each during 1883.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alwives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Plaiceh.	Bels.
Newburyport,	John Janvrin,	.	.	.	138,950	.	.	.	.	.	.	.	.	.
"	Ezra Thurlow,*	.	.	.	768,100	2,871	.	23	.	.	.	.	15	45
Sandwich,	G. F. Hope,	.	510	.	625	102	.	92	.	.	.	46	160	7
Barnstable,	James A. Fish,	.	.	.	.	.	.	535	.	2,989	.	742	30	.
"	Henry C. Lumbert,	.	.	.	.	.	.	1,865	.	.	.	.	.	.
Contreville,	C. E. Bearse,	.	.	.	.	.	.	5,091	.	121	18	11	.	.
Yarmouth,	Hiram E. Baker,	5	.	1,162	.	.	.	48	3	.	.	.	145	288
Yarmouthport,	Daniel B. Crocker,	9	.	136	150	119	.	933	137	.	.	1	.	.
Brewster,	T. Ellis, Jr.,	.	.	1,000	.	6,000	.	4,015	.	.	.	575	.	.
West Dennis,	Sylvester Baker,	.	.	7,444	.	.	.	.	.	.	.	.	.	.
Dennis,	Nathan Kelly,	.	.	.	.	.	.	.	.	1,126	.	.	.	.
"	Joshua Herce,	.	.	.	.	.	.	2,138	.	.	.	.	.	.
North Truro,	George E. Dolby,	.	.	.	.	.	.	1,151	.	.	.	.	.	.
Eastham,	Eldad Dill,	.	.	.	.	.	.	130	.	.	.	.	.	.
"	Russell Doane,	.	.	.	.	1,127	.	2,002	.	.	.	.	.	.
Orleans,	John M. Smith,	.	.	.	.	348	.	277	.	.	.	.	.	.

\* Mr. Thurlow also returns 224,400 bluebacks; and in a letter dated Oct. 23 states that from the 10th to 23d, when he stopped fishing, he caught 20,000 menhaden.

TABLE II. — SALT-WATER SEINES — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Reels.
Chatham,	Alpheus Mayo,	1	-	-	-	-	-	663	262	-	-	-	76	-
Hyannisport,	B. F. Lumbert,	-	-	-	-	-	-	2,384	-	85	-	-	-	-
Marion,	Harry Morgan,	3	-	20,479	-	-	-	-	-	-	-	-	-	-
Mattapoisett,	Dunn & Nye,	-	-	-	-	-	4	655	-	-	-	-	-	-
Westport,	Samuel G. Allen,	-	-	4,575	10,357	-	-	-	13	-	-	-	186	25
"	James J. Austin & A. G. Allen,	-	-	2,528	1,940	-	-	-	72	-	5	4	169	51
"	Perry G. Potter,	-	•	2,478	14,401	-	-	-	40	-	-	-	-	4
South Westport,	Charles A. Tripp,	-	-	713	-	-	-	-	-	-	-	-	35	67
Total,	.	19	510	40,515	934,523	10,567	4	22,916	527	4,321	23	804	816	487

TABLE No. III. — GILL-NETS. — Showing the Catch of Each during 1883.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Rela.
Barnstable,	Nathaniel N. Cook, .	.	.	.	.	.	.	1,074	.	.	.	.	.	1,100
"	James D. Kelley, .	.	.	.	.	.	.	2,703	.	300	.	.	.	60
"	David P. Nickerson,	.	.	.	.	.	.	1,686	.	.	.	40	.	68
"	David Rogers, .	.	.	.	.	.	.	4,411	.	32	.	.	187	.
"	Moses Sturges, .	.	.	.	.	.	.	560	.	12	.	.	.	.
Centreville,	W. H. Hallett, .	.	.	.	.	.	.	2,754	.	6	8	.	.	.
"	Herbert F. Kelley,	.	.	.	.	.	.	2,640	.	139	8	.	.	.
Dennis,	Zenas H. Baker,	.	.	.	.	.	.	742	.	1	.	.	.	.
"	Francis Joseph,	.	.	.	.	.	.	100	.	.	.	.	.	.
"	Venny Kelley,	.	.	.	.	.	.	1,903	.	.	.	.	.	.
Brewster,	James Eldredge,	.	.	.	.	.	.	628	5	.	.	.	.	.
Wellfleet,	W. F. Pierce, .	.	25,450	400	.	842	.	2,297	.	.	.	.	.	.
"	Heman S. Rogers,	.	.	.	.	248,783	.	2,104	.	.	.	.	.	.
Turo,	Richard S. Chandler,	.	.	.	.	2,000	.	25	.	.	.	.	.	.
"	Benjamin Coan,	.	.	.	.	1,185	.	433	.	.	.	.	.	.
"	Caleb M. Grozier,	.	.	.	.	1,770	.	373	.	.	.	.	.	.
"	Isaac Smith,	.	.	.	.	2,783	.	381	.	.	.	.	.	.

TABLE No. III. — GILL-NETS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Belts.
Truro, . . . .	Edwin P. Worthen, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
Provincetown, . . . .	James F. Atkins, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	D. W. Atwood, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	Paul L. Bangs, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	J. M. Caton, . . . .	.	.	.	.	.	.	.	.	.	.	.	4,675	.
" . . . .	Nathaniel N. Cook, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	J. B. Dyer, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	John O. Donald, . . . .	.	40,000	.	.	.	.	.	.	.	.	.	.	.
" . . . .	Manuel Francis, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	George W. Freeman, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	Hatsuld Freeman, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	John Freeman, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	Prince Freeman, . . . .	.	4,225	.	.	.	.	.	.	.	.	.	.	.
" . . . .	John Ghenn, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	S. H. Ghenn and R. Atkins, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
" . . . .	John C. P. Harvender, . . . .	.	1,343	21	.	.	.	.	.	.	.	.	399	.
" . . . .	Levi B. Kelley, . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
		.	.	.	.	.	.	486	.	.	.	.	.	.



TABLE No. III. — GILL-NETS — Continued.

TOWN OR PLACE	PROPRIETOR.	Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Bogue.	Tautog.	Flounders and Flatfish.	Belts.
East	J. Q. Hopkins.	.	.	.	.	.	.	2,168	.	.	.	23	.	40
.	James Penniman,	.	.	.	.	.	.	3,865	.	.	27	.	.	.
Orick,	W. A. Smith,	.	.	.	.	1,175	.	.	.	.	.	.	.	.
Chatham,	Jesse Gill,	.	.	.	.	1,392	.	.	.	.	.	.	.	.
"	Horatio Howes,	.	.	.	.	.	.	633	302	.	.	.	.	.
"	William Patterson,	.	.	.	.	1,000	.	.	.	.	.	.	.	.
"	J. F. Smith,	.	.	.	.	1,553	.	.	.	.	.	.	.	.
Hyannis,	David Bearse,	.	.	.	.	.	.	1,557	.	.	15	.	.	.
Marion,	Benjamin Bowditch,	.	.	.	.	.	.	300	.	.	.	.	.	.
"	George E. Leonard,	.	.	.	.	.	.	1,490	.	.	.	.	.	.
"	M. B. Marble,	.	.	.	.	.	.	1,953	.	.	35	.	.	.
"	Harry Morgan,	.	.	.	.	.	.	2,970	.	.	62	.	.	.
"	Marion T. Sylvia,	.	.	.	826	.	.	244	.	.	43	.	.	.
Matlapolsett,	Alexander B. Bowman,	.	.	.	.	.	.	485	.	.	109	.	.	.
Fairhaven,	J. C. & J. J. Allen,	.	.	.	77	.	.	610	.	27	20	.	.	.
"	Robert Blythe,	.	.	.	.	.	.	4,165	.	.	77	.	.	.
"	Samuel P. Dunn,	.	.	.	110	.	.	368	.	100	17	.	.	.





TABLE NO. IV.—CONNECTICUT RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
South Hadley, . . . .	C. C. Smith and others, . . . . .	3,099
Chicopee, . . . . .	F. W. Chapin, . . . . .	422
Agawam, . . . . .	A. Converse, . . . . .	38
" . . . . .	A. J. Hills, . . . . .	32
	Total, . . . . .	3,591

TABLE NO. V.—MERRIMAC RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
North Andover, . . . .	Eben Sutton, . . . . .	89
Amesbury, . . . . .	Jonathan Morrill, . . . . .	57
	Total, . . . . .	146

TABLE NO. VI.—TAUNTON RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
Raynham, . . . . .	J. S. Townsend & Bro., . . . .	784	89,835	-
" . . . . .	George B. Williams, . . . . .	315	128,900	-
" . . . . .	George B. & Edwin Williams, . . . .	333	130,991	-
Middleborough, . . . .	L. M. Alden, . . . . .	-	139,153	-
Taunton, . . . . .	J. W. Hart & Co, . . . . .	281	95,100	-
Dighton, . . . . .	E. & O. M. Buffington, . . . .	750	100,000	-
" . . . . .	Edmund Hathaway, . . . . .	697	110,400	294
" . . . . .	Charles N. Simmons, . . . . .	800	120,000	-
Berkley, . . . . .	Isaac N. Babbitt, . . . . .	850	144,809	-
Somerset, . . . . .	J. B. Hathaway and others, . . . .	200	50,000	-
" . . . . .	George H. Simmons, . . . . .	2	16,294	-
	Total, . . . . .	5,012	1,123,473	294

TABLE NO. VII.— OTHER FRESH-WATER SEINES AND DIP-NET FISHERIES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.	Frostfish.
Weymouth,	Weymouth Iron Co., . . . .	-	154,300	-	-
Kingston, .	Philander Cobb, . . . .	-	38,325	-	-
Plymouth, .	E. & J. C. Barnes, . . . .	-	47,152	-	-
" .	William S. Hadaway, . . . .	-	-	-	27,000
" .	B. F. Hodges, . . . .	25	36,132	2	-
" .	J. H. Newcomb & Co., . . . .	360	2,965	-	-
Barnstable, .	R. Marston & Co., . . . .	-	42,850	-	-
Centreville, .	Eli Phinney & Co., . . . .	-	80,000	-	-
Yarmouth,	David S. Baker, . . . .	-	8,713	-	-
" .	N. W. Grush, . . . .	-	268,089	-	-
" .	Long Pond Fishing Co., . . . .	-	2,478	-	-
Brewster,	J. Howard Winslow, . . . .	-	244,607	-	-
Wellfleet, .	Warren Newcomb, . . . .	-	162,861	-	-
Marshpee, .	Matthias Amos, . . . .	-	19,718	-	-
" .	David Lovell, . . . .	-	5,960	805	-
" .	W. R. Mingo, . . . .	-	25,230	-	-
Wareham, .	George Sanford, . . . .	-	463,200	-	-
Marion, .	Hammond & Sisson, . . . .	-	1,600	-	-
Mattapoisett, .	A. H. Shurtleff, . . . .	-	131,710	-	-
Westport, .	C. V. S. Remington, . . . .	-	10,000	-	-
" .	Philip S. Tripp, . . . .	6	5,066	264	-
" .	Lysander W. White, . . . .	-	1,261	1	-
Chilmark, .	Estate H. H. Smith, . . . .	-	10,733	-	-
Total, .	. . . . .	391	1,762,950	1,072	27,000

TABLE NO. VIII. — *Comparison of Returns for the Years 1882 and 1883.*

YEAR.	FISHERIES.		Shad.	Sea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluefish.	Striped Bass.	Scup.	Squeteague.	Tautog.	Flounders and Flatfish.	Bels.
	Kind.	Num-ber.													
1882,	Pounds and weirs,	85	27,769	1,201,449	1,420,919	8,102	3,239,512	310	133,805	4,219	1,991,490	67,286	40,512	114,843	4,016
1883,	" "	87	5,964	339,116	1,250,263	4,048,022	4,756,490	246	60,182	2,376	1,848,583	92,671	35,841	184,357	5,361
1882,	Sea seines,	33	1,222	20,005	186,321	10	23,717	6	54,963	1,280	53,975	839	2,321	1,784	2,936
1883,	" "	24	19	510	40,515	934,523	10,967	4	22,916	527	4,321	23	804	816	457
1882,	Gill nets,	100	516	290,608	298,309	623	563,370	81	136,705	147	45,071	3,366	3,924	31,703	97
1883,	" "	88	7	79,179	1,461	3,104	381,968	-	108,899	311	1,933	1,079	162	11,865	1,268
1882,	Conn. River seines,	3	2,770	-	-	-	-	-	-	-	-	-	-	-	-
1883,	" "	4	3,591	-	-	-	-	-	-	-	-	-	-	-	-
1882,	Merrimac River seines,	4	387	-	2,800	-	-	-	-	1	-	-	-	-	-
1883,	" "	2	146	-	-	-	-	-	-	-	-	-	-	-	-
1882,	Taunton River seines,	11	11,173	-	1,039,272	-	-	-	-	44	-	-	-	-	-
1883,	" "	11	5,012	-	1,123,473	-	-	-	-	294	-	-	-	-	-
1882,	Other fresh-water seines,	25	897	-	1,558,649	-	-	-	-	238	-	-	-	-	-
1883,	" "	23	391	-	1,762,560	-	-	-	-	1,072	-	-	-	-	-
1882,	Total,	291	44,734	1,512,090	4,446,280	8,735	3,876,599	897	325,473	5,929	2,090,528	71,471	48,757	148,330	7,049
1883,	Total,	239	15,160	418,865	4,178,682	4,985,049	5,149,025	250	191,997	5,080	1,854,837	93,173	36,807	197,068	7,116
	Increase,	-	-	-	-	4,975,914	1,272,426	-	-	-	-	22,302	-	48,738	67
	Decrease,	22	29,574	1,093,255	287,598	-	-	-	-	849	235,689	-	9,950	-	-

*Harmon Comp. Zool.*

PUBLIC DOCUMENT.

No. 25.

NINETEENTH ANNUAL REPORT

OF THE

COMMISSIONERS

ON

INLAND FISHERIES,

FOR THE

YEAR ENDING DECEMBER 31, 1884.

*10,409.*

*Garman. Salmon & trout*  
*Feb. 3. 85-*

BOSTON :

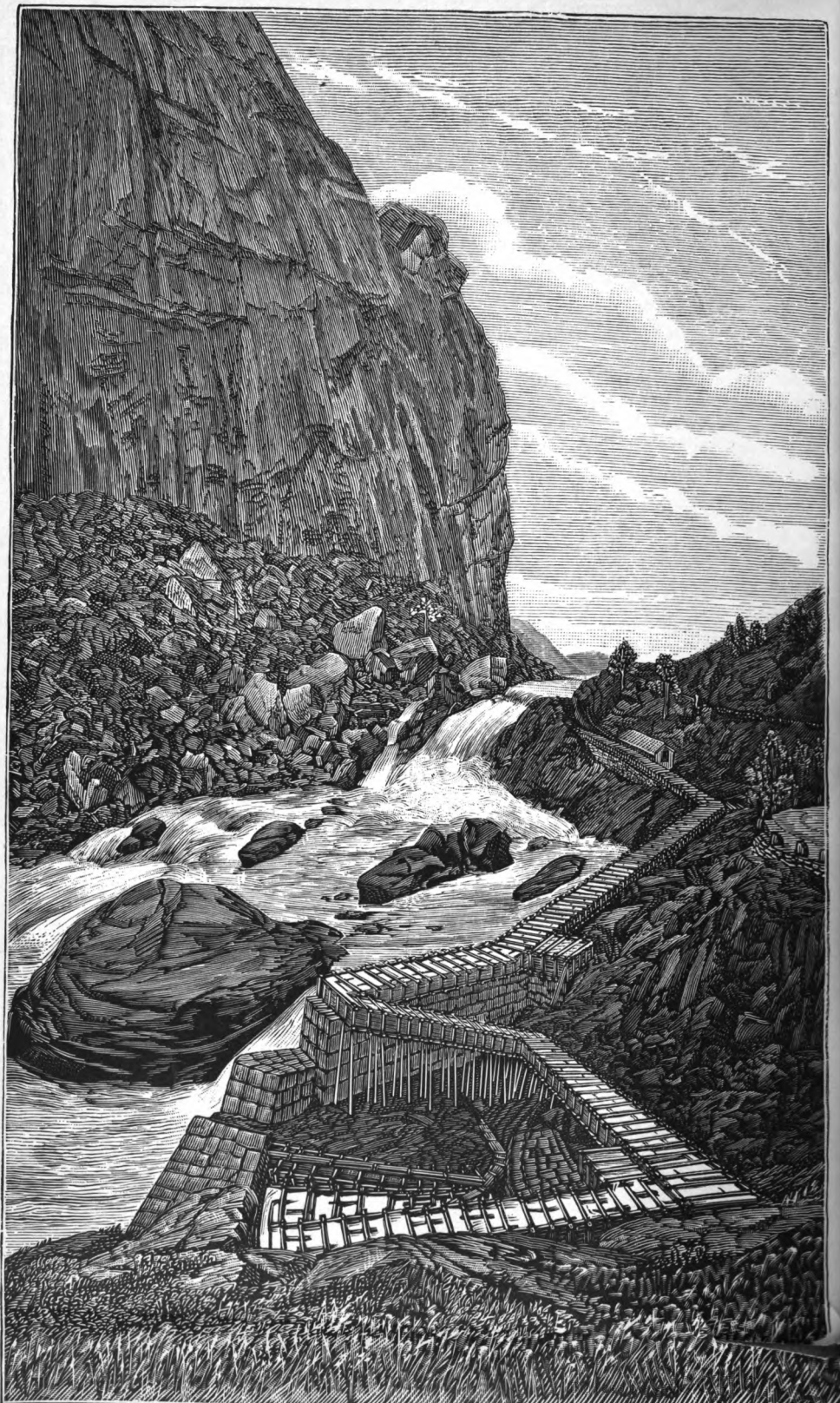
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,

18 POST OFFICE SQUARE.

S<sup>MD</sup> 1885.









*With a copious Glossary.*

*Commissaries on Inland Fishery*

INLAND FISHERY

YOUNG & CO. PRINTERS

BOSTON

WRIGHT & LOTTER PRINTING & STEEL ENGRAVING

18 POSEY STREET

1857



*With compliments of*

No. 25.

*Frederick A. ...*

*Commissioners on Inland Fisheries.*

PORT

ON

# INLAND FISHERIES,

FOR THE

YEAR ENDING DECEMBER 31, 1884.

BOSTON :

WRIGHT & POTTER PRINTING CO., STATE PRINTERS,

18 POST OFFICE SQUARE.

1885.



## CONTENTS.

---

	Page
REPORT, . . . . .	5
APPENDIX A. List of Fish Commissioners, . . . . .	31
B. Address by Hon. Theodore Lyman, . . . . .	36
C. Fishways in Norway. By A. Landmark, . . . . .	52
D. Black Bass, . . . . .	56
E. Salmon and Trout. By Samuel Garman, . . . . .	61
F. Legislation, . . . . .	82
G. List of Leased Ponds, . . . . .	86
H. Returns of Weirs, Seines and Gillnets, . . . . .	93



# Commonwealth of Massachusetts.

---

*To His Excellency the Governor and Honorable Council.*

The Commissioners on Inland Fisheries beg leave to present their Nineteenth Annual Report.

## FISHWAYS.

The fishway at Middleton, on the Ipswich River, was completed last May. That at Willowdale was not built in accordance with the plans furnished, and will require some alteration.

No fishway has yet been built at the second dam on the Acushnet River. The case is still pending in court.

The Lawrence fishway has been thoroughly repaired during the fall, and is in excellent condition.

Some repairs will be needed on the fishway at Holyoke next season.

In the appendix will be found a description, with illustrations, of the fishways on the river Sire by A. Landmark, Government Inspector of Fisheries of Norway.

## REPORT OF THOMAS S. HOLMES, SUPERINTENDENT OF THE LAWRENCE FISHWAY: FISH SEEN IN THE LAWRENCE FISHWAY IN 1884.

- May 6. (The first fish), alewives and suckers, run moderate.  
7. Alewives, suckers and chubs, run small.  
8-9. No fish.  
10. A few alewives and suckers.  
11. A few alewives and suckers.  
12. A few alewives and suckers.  
13. A few alewives.  
14. A few alewives and suckers.  
15. Alewives and suckers, run small.  
16. Alewives and suckers, run small.  
17. Alewives and suckers, run small.  
18. Alewives, run small.  
19. Alewives, run moderate; suckers, run small.

- May 20. Lampers, run moderate; alewives and suckers, run small.  
 21. Alewives, run moderate; lampers and suckers, run small.  
 22. Lampers and suckers, run small (river has risen, muddy).  
 23. Lampers and suckers, run small (water very muddy).  
 24. Lampers and suckers, run small.  
 25. Lampers, suckers and alewives, run small.  
 26. Lampers, run moderate; suckers and alewives, run small.  
 27. Alewives, run large; lampers, run moderate.  
 28. Lampers, run large; alewives and suckers, run small.  
 29. Lampers, alewives and suckers, run small.  
 30. Lampers, alewives and suckers, run small.  
 31. Lampers, alewives and suckers, run small.
- June 1. Lampers, alewives and suckers, run small.  
 2. Lampers, run large; alewives and suckers, run small.  
 3. Lampers and suckers, run large; alewives, run small.  
 4. Lampers, run large; suckers, run small.  
 5. Lampers and suckers, run small; a few red-fin shiners.  
 6. Lampers, suckers and chubs, run large.  
 7. Lampers, suckers and chubs, run large.  
 8. Lampers, alewives and suckers, run moderate.  
 9. Alewives and suckers, run large; lampers, run moderate.  
 10. *One salmon*, 6 pounds; lampers, suckers and alewives, run moderate.  
 11. *Three salmon*, 12 to 20 pounds; lampers, suckers and alewives, run small.  
 12. Lampers, run moderate; suckers and alewives, run small.  
 13. *One salmon*, 14 pounds; lampers and suckers, run small.  
 14. Lampers, suckers and small silver eels, run small.  
 15. Lampers, suckers and small silver eels, run small.  
 16. Lampers, suckers and small silver eels, run small.  
 17. *Two salmon*, 10 to 20 pounds; lampers and suckers, run small.  
 18. Lampers and small silver eels, run small.  
 19. *One salmon*, 14 pounds; lampers and small silver eels, run small.  
 20. Lampers and small silver eels, run small.  
 21. Lampers and silver eels, run small.  
 22. Lampers and silver eels (mostly small ones), run small.  
 23. Lampers, suckers and silver eels, run small.  
 24. *One salmon*, 15 pounds; a few lampers and small silver eels.

During the rest of the month of June suckers, in small numbers, and a good many small silver eels, were all the fish seen in the fishway.

In July small silver eels, in large numbers, with now and then a large one, and a few suckers, were all the fish in the fishway. The water was shut out of the fishway about a third part of the time because the river was low.

Silver eels and suckers were the only fish in the fishway in August. Water was shut out of the fishway the last half of the month.



Water was shut out of the fishway, excepting Sundays, in September until the 23d; the fall run of fish commenced on the 24th, and was as follows:

Sept. 24. *One salmon*, 12 pounds; a few suckers.

25. }  
26. } No fish.  
27. }  
28. }

29. *One salmon*, 14 pounds; a few suckers.

30. *Two salmon*, 12 to 14 pounds.

Oct. 1. *One salmon*, 12 pounds.

2-13. No fish.

14. *One salmon*, 10 pounds.

15. No fish.

16. *One salmon*, 14 pounds.

17-21. No fish.

22. *One salmon*, 12 pounds.

No fish after the 22d to the end of the month, when water was shut out.

#### SHAD HATCHING AT NORTH ANDOVER

Was continued during the past season. As was expected there was a still further falling off of the spawning fish, sufficient time not having elapsed for the young, hatched the two previous years, to mature. It being desirable to return alive to the water, all shad not used for spawning, a net with a mesh of two and a half inches was used to prevent gilling them. This was effective; not only were no salmon killed, but very few shad were injured, and its use led to important information regarding the two previous years' hatching. It was found that in the river at North Andover were large numbers of young shad, one and two years old; sometimes a hundred or more would be taken at one sweep of the seine with scarcely any mature fish among them. These small shad were all males. As has been heretofore stated, females do not ascend the river until they are three or four years old, or until they are sufficiently mature to spawn. The milt in shad and salmon is ripe at the age of one and two years. With the enforcement of the law prohibiting the use of small mesh seines in the coves and eddies on the lower part of the river, and the continuation of the hatching at North Andover, there is every reason to warrant the con-

clusion that a large increase in the shad fisheries of the Merrimac may be secured. A small increase may be expected in 1885, and a still larger the following year.

*To the Commissioners on Inland Fisheries.*

GENTLEMEN: — We respectfully submit the following report, showing the full details of the work of hatching shad at North Andover, for the season of 1884. The hatchery was opened June 10th, and closed July 5th.

Number of shad taken, . . . . .	166
“ returned to river alive, . . . . .	74
“ given away, . . . . .	92
“ males, . . . . .	132
“ females, . . . . .	34
“ salmon taken, . . . . .	9
“ returned to river alive, . . . . .	9

From the above table it will be seen that a large percentage of the fish taken were males. Of the 34 females, only 20 were found to be in condition to furnish spawn, and from this number 268,000 spawn were taken. The number of shad hatched was about 252,000. These were turned into the river at North Andover. Owing to the short supply, no young fish were sent to the New Hampshire Commissioners, as in former seasons. The average cost to the State, for hatching shad at North Andover, for the last three seasons, has been a fraction less than 38 cents per thousand. The following table will show the number of fish taken each day, the time of drawing the seine, the temperature of the water and air, the proportion of males to females, also the number of fish taken at each sweep, and the estimated amount of spawn taken.

1884.	Shad taken.	Males.	Females.	Temperature of Water at 7 p.m.	Temperature of Air at 7 p.m.	Time of hauling seine.	Fish per sweep.	Estimated amount of spawn taken.
June 11, .	11	11	0	68	62	7, p.m.	11	000
" 12, .	15	11	4	68	70	7, 8, "	8, 7	30,000
" 13, .	4	4	0	68	66	7, 8, "	1, 3	000
" 14, .	5	2	3	69	61	7, 8, "	2, 3	000
" 16, .	2	1	1	69	68	6, 7, 9, "	0, 2, 0	20,000
" 17, .	19	16	3	71	71	7, 8, 9, "	3, 10, 6	30,000
" 18, .	13	10	3	73	73	7, 8, "	2, 11	30,000
" 19, .	5	4	1	74	72	7, 8, "	0, 5	10,000
" 20, .	18	17	1	76	72	7, 8, 9, "	10, 5, 3	10,000
" 21, .	13	11	2	80	76	7, 8, 9, "	8, 3, 2	30,000
" 23, .	15	12	3	76	65	7, 8, 9, "	2, 7, 6	35,000
" 24, .	4	3	1	78	69	8, 9, "	1, 3	15,000
" 25, .	5	3	2	79	68	7, 8, "	2, 3	10,000
" 26, .	5	3	2	76	70	7, 8, 9, "	3, 2, 0	000
" 27, .	2	0	2	74	67	8, 9, 10, "	1, 1, 0	000
" 28, .	4	4	0	74	68	7, 8, 9, "	2, 2, 0	000
" 30, .	7	5	2	77	70	7, 8, 9, "	2, 3, 2	30,000
July 1, .	4	3	1	79	70	8, 9, 10, "	2, 0, 2	8,000
" 2, .	5	4	1	79	69	7, 8, 10, "	2, 3, 0	000
" 3, .	8	6	2	79	68	7, 8, 9, "	3, 3, 1	10,000
" 5, .	2	2	0	78	70	7, 8, "	0, 2	000

During the fishing season of only three weeks, thousands of young shad were taken, and of course returned to the water alive. The return of the young shad to the Merrimac in such large numbers is, to say the least, an indication of good results from the work of hatching. No perceptible increase of mature shad can reasonably be expected until the season of 1885, and perhaps a year later, as a great many of those hatched in 1882 were undoubtedly destroyed at the mouth of the river. The Act of the Legislature prohibiting the use of fine mesh seines is certainly a step in the right direction; for if it is desirable to be successful in fish culture, one thing must not be lost sight of, viz., the protection of the young fish.

The restocking of a stream in the exhausted condition of the Merrimac, is a work not to be accomplished in a moment. It requires thought, time, patience and money.

B. P. CHADWICK.  
EDWIN F. HUNT.

#### CARP.

Through the kindness of Prof. Spencer F. Baird, U. S. Commissioner of Fish and Fisheries, four thousand young carp were forwarded to this State for distribution, arriving here about Nov. 9, 1883.

There were applications enough on file to have taken all

these fish, but although the parties were notified that the fish were ready for delivery, many were not sent for, and a considerable number were lost in consequence of not having a proper place to keep them. They do not thrive in tanks supplied with spring water, and they could not have been kept well in any other place, subject to the orders of applicants. Notwithstanding all that has been said in former reports, more than half of the persons applying for them were without suitable ponds. It was to be hoped that a fish so easily cultivated, and apparently of considerable value in many parts of the country, would receive more attention. Its cultivation in Southern and Western States is rapidly increasing. While they may not, in this climate, make the phenomenal growth attributed to them in some of the States, the lower temperature of the water will probably enhance their value as edible fish. The time will come when not only the farmer will find it profitable, but gentlemen owning estates will consider them incomplete without a well-arranged carp pond. If persons having suitable ponds for these fish will send in their orders for them before the first of September, they can be filled about the last of October, with no expense except transportation. Carp were delivered to the following persons in 1883:—

John F. Wild,	Wilmington.	F. S. Bennet,	Tyngsboro'.
A. W. Austin,	Boston.	Geo. D. Danforth,	Tyngsboro'.
Nathan Keith,	Campello.	F. A. Stimson,	Rockport.
H. Goulding,	So. Natick.	M. H. A. Evans,	Graniteville.
W. H. P. Wright,	Lawrence.	H. W. Phelps,	Springfield.
J. T. Mosher,	Squibnocket.	E. Rude,	Huntington.
C. E. Gould,	Leominster.	O. W. Fiske,	Bedford.
G. P. Dwight,	Dunstable.	J. B. Batchelder,	Hyde Park.
Geo. Bradshaw,	Springfield.	E. T. Kent,	Malden.
Benj. F. Bee,	Harwich.	W. P. Hood,	Melrose.
Edw'd Gillett,	Southwick.	B. Morse,	E. Douglas.
T. H. Meek,	E. Douglas.	— Messenger,	Boston.
J. Dyer,	Truro.	Miss S. L. Gray,	Andover.
O. K. Rice,	Ayer.	J. L. S. Thompson,	Lancaster.
J. A. Harwood,	Littleton.	Enoch Foster,	Tewksbury.

### TROUT.

We received from the works at Plymouth, N. H., about one hundred and twenty-five thousand (125,000) trout spawn,

which were hatched with very little loss. These would have filled the orders on hand, had it not been for the mischievous action of some boys, who broke the windows at the head of the tank, and endeavored to feed the fish by throwing in several handfuls of orange peel, which caused a loss of about fifty thousand young fish. The effort to restock our depleted trout streams has thus far been successful, the only drawback being the small number distributed to each applicant. The amount of spawn for this year will be greatly in excess of last season, and all orders can probably be liberally filled. The trout and landlocked salmon fry are delivered free at the hatching-house, Winchester, Mass. Cans necessary for their transportation will be loaned to all applicants, on condition that they are immediately returned.

*Distribution of Young Trout.*

	CANS
F. Dimond, No. Carver, . . . . .	1
D. Fisk, Upton, . . . . .	1
A. Barrus, Goshen, . . . . .	2
H. Goulding, So. Natick, . . . . .	2
M. Ryson, Foxborough, . . . . .	1
Wm. H. Little, Sheffield, . . . . .	2
J. Alden, Stoneham, . . . . .	1
G. F. Newbegin, Salem, . . . . .	1
H. C. Stark, Hyde Park, . . . . .	1
A. H. Manning, Pittsfield, . . . . .	1
J. O. Parker, Methuen, . . . . .	1
J. Cummins, Woburn, . . . . .	1
H. H. Wyman, Winchendon, . . . . .	1
Aug. Fels, Lowell, . . . . .	1
J. A. Loring, Boston, . . . . .	4
J. B. Hull, Stockbridge, . . . . .	2
P. Aldrich, Boston, . . . . .	1

NOTE. — There may be some discrepancies in these lists of fry delivered at the hatching-house, arising from the haste occasioned by frequently having to deliver several lots for the same train.

**LAKE SUPERIOR SALMON TROUT.**

One hundred thousand spawn of these fish were received and hatched, with little loss, and distributed as follows : —

	CANS.
D. Fisk, Upton, . . . . .	1
J. D. Francis, Pittsfield, . . . . .	1

	CANS.
J. B. Hull, Stockbridge, . . . . .	8
T. Lawrence, Falmouth, . . . . .	4
J. F. Hinds, Webster, . . . . .	2
A. C. Brigham, So. Abington, . . . . .	2
H. C. Stark, Hyde Park, . . . . .	1
M. Gifford, Falmouth, . . . . .	4
A. H. Manning, Pittsfield, . . . . .	1
H. H. Wyman, Winchendon, . . . . .	1
J. O. Parker, Methuen, . . . . .	1
C. G. Reed, Worcester, . . . . .	1
M. Palmer, Groton, . . . . .	1
C. E. Peck, Wilbraham, . . . . .	2

### LANDLOCKED SALMON.

The following report of Mr. Hodge, Commissioner of New Hampshire, shows that the introduction of this fish in that State has been a decided success. Similar reports have been received from some of the ponds in Connecticut. It is to be regretted that so little information upon the subject has been received from the leased ponds in this State: —

The habits and haunts of these fish are such that they may exist in considerable numbers in a pond or lake without the public being aware of it. Their presence in New Hampshire and the northern part of Connecticut would be more likely to be known than in the waters here, for hundreds of expert fishermen who understand how to catch this fish, annually visit those States, having ample time for investigating and exploring every stream and lake. If there is any fish in New Hampshire that has not made the acquaintance of some one of this great army of anglers, he ought to be considered unfit for the table.

The regulations governing leased ponds in this State require that, for the present, all landlocked salmon shall be returned to the water alive. The temptation to retain so remarkable a fish may possibly have had some effect on the returns.

Of the ponds where these fish have been introduced, only fifteen have reported any catch. In some of the waters most favorable for their growth, they have not been introduced sufficiently long to expect, as yet, any favorable results. As a rule they do not make their appearance until the third or fourth year after planting. The following list shows the

distribution of these fish for 1884. The number of fish in a can, of course, varied somewhat, according to the temperature and the distance to be carried.

	CANS.
Thomas Lawrence, Falmouth, . . . . .	6
Charles G. Reed, Worcester, . . . . .	7
J. B. Hull, Stockbridge, . . . . .	3
Henry A. Boyden, Sharon, . . . . .	2
C. E. Peck, Wilbraham, . . . . .	2
Meltiah Gifford, Waquoit, . . . . .	4
John F. Hinds, Webster, . . . . .	2
E. S. Thayer, Salem, . . . . .	8
W. A. Bullard, Cambridgeport, . . . . .	6
A. H. Manning, Pittsfield, . . . . .	3
E. Howes, Gloucester, . . . . .	2
S. P. Keyes, New Marlborough, . . . . .	4
Luther Hill, Spencer, . . . . .	2
B. P. Chadwick, Bradford, . . . . .	1
H. H. Wyman, Winchendon, . . . . .	4
J. O. Parker, Methuen, . . . . .	2
Moses Palmer, Groton, . . . . .	1
C. E. Gould, Leominster, . . . . .	2

Mystic Pond, Medford and Winchester, 20,000 fry.

PLYMOUTH, N. H., Dec. 8, 1884.

*E. A. Brackett.*

MY DEAR SIR:—In answer to your question as to the result of the introduction of the landlocked salmon or the Schoodic salmon, I am happy to say that we consider them a success and a great addition to our game fishes; good reports are being received from various parts of the State.

In some waters their growth has been remarkable, particularly in Squam and Sunapee lakes. The first plant in Squam Lake was made in 1877. In June, 1880, a salmon was taken in the outlet that weighed  $6\frac{1}{2}$  pounds; another measured 27 inches in length, weight not taken.

In November, 1883, six years after the lake was stocked, a pair, male and female, were speared on their spawning bed, weighing 10 and 15 pounds each. This last spring another was caught,  $9\frac{1}{2}$  pounds. I only give you the first that I know were weighed; many others, fully as large, have been reported.

In Sunapee, first stocked in 1877, they have done fully as well. In 1882 and 1883, salmon were taken weighing  $6\frac{1}{2}$ ,  $7\frac{1}{2}$  and  $8\frac{1}{2}$  pounds, and others of 5 and 6 pounds. The largest taken this year, that I have a record of, weighed  $11\frac{1}{2}$  pounds. This was a

female fish. I could give you many other instances of the reported capture of large landlocked salmon, but the above is enough to show that they are a success in this State.

In some of the small lakes they have not done as well, while in others, no larger, they have been a success. This result might have been expected, as the young fry were introduced into the various ponds and lakes without any examination of the water to ascertain whether it contained suitable food for the young fry, or whether the water was of sufficient depth for the adult fish.

I am, respectfully, yours,

E. B. HODGE.

#### SALMO SALAR.

The distribution of young salmon is detailed in the following report by Mr. E. B. Hodge, Commissioner of New Hampshire and superintendent of the works at Plymouth, carried on jointly by the two States.

The effort to stock the Merrimac with California salmon, mainly on account of the cheapness of the spawn and the more rapid growth of that fish, was a failure. This, with the large number of breeding fish unlawfully destroyed by the fishermen below Lawrence, four years ago, retarded the stocking of the river for several years. This has now been bridged over, and a much more rapid increase of salmon may be expected hereafter. There have been three seasons of remarkably low water in the river, which has greatly interfered with the salmon reaching their spawning grounds. According to records kept at Lowell, it is probable that this drouth will be followed by three or four years of abundance.

The fall run of salmon this year was unusually large, indicating an increased run for next season. The works at Plymouth are being extended and greatly improved.

*To the Commissioners on Inland Fisheries for the Commonwealth of Massachusetts :*

After my report to you of Nov. 26, 1883, I received in January, from Bucksport, Maine, 550,000 Penobscot salmon eggs, 350,000 of which was the share belonging to Massachusetts from the Penobscot salmon-breeding establishment; 200,000 were given by Prof. S. F. Baird, U. S. Fish Commissioner. These, with the eggs



taken from the salmon caught in the Pemigewasset, making over 600,000, were hatched, with a very small loss (less than one and one-half per cent.), and the young fry were planted in the Pemigewasset River in June; 250,000 were placed in the east branch of the Pemigewasset, at the terminus of the P. V. R. R. in North Woodstock, some twenty miles above the hatchery; the remainder, in lots of 50,000, at various points from two to fifteen miles above the falls. This is largest plant by nearly 200,000 that has yet been made in the head-waters of the Merrimac.

The spring run of salmon was about the same as last year. Unfortunately, the water was so low in September that none of the fall run, which I understand was unusually large, reached here. The salmon taken this season were all large fish, weighing from fifteen to thirty-five pounds.

As usual, the young salmon were very plenty in the river this season. They begin to leave this part of the river the last of August, and by the first of October very few can be found, and they are male fish, from five to seven inches in length, with the milt fully developed.

There are now in the hatchery 380,000 eggs of the brook trout, and, when all taken, there will be about 400,000, of which I shall send you one-half as soon as they will do to move.

As instructed, at the annual meeting of the Massachusetts and New Hampshire Commissioners, I have added 5,000, from four to eight inches in length, to the stock of breeders, which will, another year, add materially to the number of eggs. I have built a pond, 18 by 60, to accommodate the small trout; the sides are planked thirty inches above the water. The small pond at the head of the old trout tanks has been enlarged, planked and graded. I find it necessary to have the sides of the ponds planked to prevent mink from destroying the trout.

Respectfully yours,

E. B. HODGE, *Superintendent.*

PLYMOUTH, N. H., Dec. 8, 1884.

#### FISHERIES ON THE LOWER MERRIMAC.

In the last two reports the cause of the decline of shad in the Merrimac was fully set forth. As the statements therein made were the result of a thorough investigation, extending over a series of years, there seemed to be no doubt that this depletion was largely due to the small mesh seines used at the mouth of the river for taking bait. It was therefore

recommended that no seine of less than two and a quarter inches be allowed for that purpose. This was accepted by the last Legislature, and the only argument used against its passage was that it would reduce the fishermen to a state of poverty little better than starvation. The fact that none of these fishermen are dependent on the use of their seines for a living was ignored.

As it has always been the earnest desire of the Commissioners to give all fishermen the largest possible liberty in fishing consistent with the preservation of their interests, at the suggestion of several of the leading citizens of Newburyport, a meeting of the fishermen was called for the purpose of consultation and to find out how far they had been injured by restricting them to a larger mesh seine. It was claimed by these gentlemen that the fishermen were laboring under a misapprehension, and that they had already received all, if not more, than they could reasonably expect, and that an explanation from the Commissioners would be likely to lead to a better understanding of the case, and probably remove all unpleasant feelings on the part of the fishermen. The meeting was held on the 24th of June, and the following statement, made in the "Newburyport Herald" by one of its reporters, who was present, is substantially correct:—

"A social conference between Commissioner Brackett and the ward one fishermen was held at the home of Deputy Commissioner Hunt, last evening, the object being to arrive at a better understanding on the part of fishermen and commissioner, relative to the various phases of the local fishery laws. All the seining crews were represented, and to the first question of Mr. Brackett, as to whether the fishermen had really been injured by being forced to use a  $2\frac{1}{4}$ -inch mesh, all substantially agreed that they had not; all freely admitted that the  $2\frac{1}{4}$  mesh let the smaller fish slip through, but held the larger and to them more valuable fish. Mr. Brackett said that he had believed this to be the case after extensive conversation among fishermen elsewhere, and for that reason had favored the  $2\frac{1}{4}$  mesh. He also said that the commissioners had no desire whatever to crowd the fishermen; they only asked for square dealing and compliance with the law on their part, and were willing to do everything within the law that would prove of benefit to them in return. Regarding the issuing of permits to catch sea shad, he said that the resolution relating to it, which had become a law, was

written by himself, and was purely a voluntary act on his part in the interests of the fishermen. These permits he had authorized Deputy Hunt to issue, subject to the discretion of the latter, and with the distinct understanding that Mr. Hunt, at all times, is to have the privilege of looking over the nets, and examining the fish caught, to see that the law is not violated by the catching of river shad, salmon and other prohibited fish. The men agreed to this, and Mr. Brackett suggested that a record of all fish caught should be kept, that the value of the industry might be easily computed at the end of the season. He also said that if the men had a grievance at any time, it would be better for them to confer with the commissioners, and by that means all difficulties could be more easily adjusted, than by running to the legislative committees. The men all appeared pleased to meet Mr. Brackett, and the meeting closed with a hearty expression of friendly feeling on both sides. The spokesman of the seiners, after the meeting, said it had been a good thing for the fishermen, who had been led to believe that the commissioners had a disposition to crowd them, whereas they were trying to protect the river fish, and at the same time allow the fishermen every privilege which could possibly be allowed by the law."

Mr. Caswell, one of the leading seiners, stated that he had, in times past, taken large quantities of small fish for bait, so small that the vessels refused to accept them, and he was obliged to throw them away. If they had been allowed to grow they would have been valuable. He thought the law a good one, and in the interest of the fishermen.

#### SEA SHAD.

Permission was given to take these fish, and about seven thousand were caught. They were all the true shad. A careful examination showed that only one of this large number had well developed spawn. In all the others the spawn and milt were so small as to preclude the possibility of their spawning before another season. The prevailing opinion is that these fish have spawned in more southern waters, and in moving north along the coast, occasionally run into the mouths of our rivers. So far as we know, this theory is not based upon any well-authenticated facts. Possibly the solution of this question may be found in another direction. Within a few years it has been definitely settled that the

Atlantic salmon spawn only every other year, and should it be proven that the same law holds good with the shad, it might account for the appearance of these fish at the mouth of the river at the time when the ripe fish are seeking their spawning grounds. In the sea, shad move in schools, and on reaching the mouths of the rivers to which they belong, only those ready to spawn go up; the others may loiter for a few days in the brackish water. From testimony obtained during the last season, it is probable that a small school of these fish may be found annually, in the month of June, inside of Plum Island Light, and that this school is distinct from the phenomenal movement described in the last report. Until something more definite is known about them, it cannot be determined whether these fish belong to the Merri-mac or to some other river.

In considering the fisheries of the lower part of the Merri-mac, it is important to understand that the present arrangement is, in part, a compromise, reached after a thorough discussion by both sides, for the two and one-quarter mesh will necessarily destroy more or less young shad. In reaching this settlement there have been expensive hearings, some legislation, and a great deal of unnecessary debate. The interest of the State has been fairly preserved, and the fishermen express themselves satisfied with the results. So long as they adhere to this, there seems to be no good reason for any further conflict. There were no menhaden in the river this summer, and the total amount of fish taken for bait did not exceed 350 barrels, valued at \$440.

NEWBURYPORT, Nov. 10, 1884.

*E. A. Brackett, Chairman of Board of Commissioners on Inland Fisheries:*

I regret to say, that owing to the absence of menhaden in the river, the past season has not been a prosperous one for the fishermen.

The fishing commenced the 20th of June, with four seines, owned as follows: John Janvrin, W. H. H. Perkins, Charles Caswell & Co., and Ezra Thurlow & Co. The catch for the season was: bait, 350 barrels, valued at \$440; sea shad, 7,000, valued at \$300; total value, \$740. This was divided among some thirty fishermen, according to their interest in boat and seine. Had it

been equally divided, each would have received \$24.66 $\frac{2}{3}$ . No action of the legislature or of your Board, could have aided the fishermen in obtaining better results. All that could be done was done for their benefit. The fish were not here, and therefore could not be caught. Fortunately, none of the fishermen are dependent upon the use of their seines for a living.

It will be seen, by reference to my report of last year, that the real value of the fisheries of the lower part of the Merrimac is dependent upon the menhaden. Whenever these fish are plenty in the river, the fishermen are amply rewarded for their labor; at other times the fishing is more a matter of diversion than of profit. The order permitting the taking of a considerable number of what are here called sea shad, was promptly carried out. Of the twenty-five hundred inspected by your Board, only one contained spawn. There was none in the catch which I afterward examined. All these fish were the true shad, belonging, if not to the Merrimac, to some other river. If there was any doubt as to their location, the benefit of the doubt was given the fishermen, in your decision granting them the privilege of taking these fish.

I also, under your direction, gave permission to take sperling at the extreme mouth of the river, on condition that no other fish were destroyed. The shad, which appeared early in the season, lasted about one week, then began to fall off, and in a few days entirely disappeared. Then the bluebacks struck into the river and lasted about a month.

I am happy to say that the good feeling on the part of the fishermen, which grew out of the meeting at my house, last June, where everything pertaining to the fisheries of the Merrimac, was freely and frankly discussed, still continues. No one complains that he has been injured by the passage of the law restricting them to the use of the 2 $\frac{1}{2}$ -inch mesh, and the better understanding of both sides of the question has, in my opinion, led them to honestly endeavor to keep their part of the obligation.

Yours truly,

EDWIN F. HUNT.

### LOBSTERS.

The legislature, at its last session, passed an amendment to the lobster law, placing the enforcement of it in the hands of the Commissioners on Inland Fisheries. At the hearing before the committee on fisheries, which led to the passage of this act, all the dealers and lobster fishermen who were present were very earnest that the law should be enforced. There is no

reason to believe that they have not acted in good faith, but there is always a lawless element that requires looking after, and several arrests and convictions were made during the past season. So far as the cities and larger towns are concerned, the law has been fairly maintained. There is, however, a defect in the law, which, if not corrected, will make it of little value. Large numbers of small lobsters were caught during the year, put into locked cars, smuggled aboard vessels, and sent to New York, where there is no law regulating the size. Many were also sold at the hotels at watering places, or used for bait. Although fully satisfied of the fact, the officers had no authority to open the cars, and consequently no evidence that would convict. This has led to a good deal of complaint on the part of the law-abiding fishermen, who claim that nothing has been gained by the attempt to arrest this wholesale destruction of young lobsters. The feeling among many of the dealers and fishermen is that nothing short of a closed season, in which no lobster pots are permitted to be used, will be effective. If the lobster fisheries are to be preserved, — are to be saved from annihilation, there is a plain, simple way of doing it; one that requires no great amount of scientific knowledge, only a little exercise of common sense. You cannot have eggs, if you destroy your hens; you cannot raise chickens, if you do not save and protect the eggs. The lobster is a bay or estuary animal; it does not migrate like the cod, haddock and mackerel. Its range is so limited that it can be and has been so reduced in size and numbers as to be of little value in this and adjoining States.

The  $10\frac{1}{2}$ -inch law, if rigidly enforced, would be a step in the right direction. It is profitable neither to the dealer nor the consumer, that the lobster should be marketed below this size. Again, lobsters less than  $10\frac{1}{2}$  inches, are seldom found with spawn; therefore, supplement this act with the right of search, and a close season of two or three months, covering the principal part of the spawning season, or that period when the most spawn is deposited, and you conserve not only the interest of the State but of the fishermen also.

OFFICE OF THE CHIEF OF THE DISTRICT POLICE,  
65 BOWDOIN STREET, BOSTON, MASS.,  
December 1, 1884.

E. A. BRACKETT, Esq., *Chairman Commissioners on Inland Fisheries.*

DEAR SIR: — In answer to your inquiry as to the enforcement of the statute, chapter 212, Acts of 1884, "An Act for the Better Protection of Lobsters," I have the honor to inform you that from the reports of the officers of this force, I am of the opinion that the law is, in a great degree, inoperative.

It is alleged by many honest dealers, that large numbers of short lobsters are taken in every catch, and that it is of rare occurrence that they are returned to the water. These short lobsters, with others, are placed in floating cars, and moored some distance from the shore. Sales are made direct from said cars, and evidence of violations of the law cannot be obtained. Open sales of short or mutilated lobsters are seldom reported, and but ten prosecutions have been made since the enactment of the statute. To make the law more effective, the right of search, and authority to enter places and buildings where lobsters are kept, should be given to officers, whenever there is reasonable grounds to believe that the provisions of the law are violated.

Very respectfully,

RUFUS R. WADE,  
*Chief District Police.*

EXTRACTS FROM REPORT OF W. II. VENNING, ESQ., INSPECTOR OF FISHERIES FOR THE PROVINCE OF NEW BRUNSWICK, FOR THE YEAR 1883.

*Lobsters.*

The effects of the enormous annual drain made on this shell-fish for the last fifteen years, are now plainly to be seen, and even interested cupidity can no longer deny them. Though the number of factories has increased and greater numbers of men have been employed, the returns show a decrease of nearly 2,000,000 cans, compared with the quantity put up last year. This serious decline in numbers, added to the still more serious decline in size, visible everywhere, points to the certain extinction of the fish, if the business continues to be pursued on the same excessive scale. In former reports, both annual and special, I have expressed my conviction that no creature can long withstand so great a yearly drain as has been made on the lobster. This drain has been out of all

proportion to the power of so slow-growing a creature to multiply. Even the cannerymen themselves are now convinced of this fact; but in the hope that the fish will last their time, they are redoubling their exertions to increase their catch; are endeavoring to make increased numbers of small fish compensate for the almost total absence of large ones, and are striving to have the present insufficient restrictions relaxed. While every officer in the Province, in whose district this fishery is pursued, records the fact of its failing supply, none of them, except Overseers Wyse of Chatham, Girouard of Buctouche, and Deacon of Shediac, offer any suggestions for its improvement or conservation. I have given their opinions in their own words in the abstracts from their reports. Whatever opinion I may entertain of the practicability of Overseer Wyse's views, it cannot be denied that their adoption would give lessees a direct interest in so conducting their business that their breeding stock could not be exhausted, and that none but mature and healthy fish should be killed. At present, neither cannerymen nor fishermen have any interest in protecting or conserving the fishery; their interest now lies rather in destroying it by over-fishing. But with respect to the opinions of Messrs. Deacon and Girouard, my own observation forces me to differ from their conclusions. The present close time extends from 20th August to 20th April, a period of eight months. Soft-shelled lobsters, those with eggs attached, and all less than nine inches in length, are now forbidden to be killed. With all this protection, the fishery shows indisputable signs of exhaustion. Not only is the supply failing, but the average size has fallen below nine inches. Had the law been rigidly enforced this season, every cannery in the Province would have been closed. In the face of these undeniable facts, I cannot see how *extending the fishing season* is going to improve matters, — increase the supply of fish or raise their average size. My conviction is now what it has been for years, that the fishery has been pursued to so unreasonable an extent that it is sheer folly to suppose it can continue much longer on the same extravagant scale. Mere tinkering with it will do no good. This has been tried and has failed most signally. Some radical change must now be made, or the fishery is doomed to extinction.

EXTRACT FROM ANNUAL REPORT ON THE FISHERIES OF NOVA SCOTIA FOR THE YEAR 1883, BY W. H. ROGERS, ESQ., INSPECTOR.

There have been several thousand tons shipped alive from Yarmouth and Shelburne to the United States during the past two or three years, — a profitable trade, likely to increase in the future.



The lobster is one of the most important items in our fisheries, and will become more and more so. Hence, every means should be adopted not only to facilitate the business but to protect the "raw material" from exhaustion. To this end, a rigid enforcement of an ample close season is indispensable, together with the protection of the female and small lobster.

The difficulty in regard to the closed season in the Provinces is that it does not appear to cover the best part of the spawning season.

In Scotland there is a closed season from June 1 till September 1, under a penalty of £5 for each lobster caught during that time.

In Norway and Sweden the close time is from July 15 to October 15. From the following report on the lobster fisheries of Norway, it will be seen that for a few years after the passage of the act making a closed season there was a falling off of the catch, but in the end the fishermen were greatly benefited. With a closed season of three months they were able to take a great many more lobsters than when they were allowed to fish the whole year.

EXTRACT FROM THE REPORT OF THE UNITED STATES FISH COMMISSIONER ON THE "NORWEGIAN LOBSTER FISHERY AND ITS HISTORY, BY AXEL BOECK."

By this law, which forbids all fishing during two and a half months, the yield of the fisheries was of course somewhat diminished during the first years following its passage, till the protected young could reach the necessary size. Thus fewer were exported in 1849 and 1850 than during the preceding years, so that, while from 1846 to 1848 about 600,000 were exported, the number had sunk to 408,310 in 1849 and 427,600 in 1850. This decrease, however, is not merely owing to the circumstance that the number which were usually caught during the close months remained in the sea, but likewise to the fact that the English joint-stock company which carried on the exportation from the districts of Jarlsberg and Laurvig began to pay a lower price for the lobsters, so that the fishermen resolved no longer to catch any, even during those months when they were permitted to do so. While from this district there were from 1846 to 1848 on an average about 26,000 exported every year, only 7,960 were exported in 1849, 1,664 in 1850, and none at all during the following years; but, in 1855,

14,470 were again exported, chiefly to Copenhagen. Since 1850 the lobster trade has steadily increased, and the governors, in their quinquennial reports on the economical condition of their respective districts, state that protection seems to have produced this result.

In the district of Stavanger, the exports rose, from 1850, when they amounted to 120,653, to 204,803 in 1854. In the South Bergen district it is also stated that the fisheries have increased. Of the following years, the least productive was 1858, when the exports from the whole kingdom only amounted to 553,238, on account of unfavorable weather during the whole fishing season; but, in 1860, the number had again risen to 1,333,037, and kept tolerably steady during the following years, so that the exports during these years were about the same as during the years 1825-30, when they were at their highest, only to decrease very rapidly during the following years. In 1860 the exports rose to 1,000,000, and increased constantly, till in 1865 they very nearly reached 2,000,000; viz., 1,956,276.

#### RETURNS OF WEIRS, SEINES, AND GILLNETS.

Returns have been received from 205 fisheries, comprising 93 pounds and weirs, 22 sea seines, 63 gillnets, 2 Connecticut River seines, 2 Merrimac River seines, 10 Taunton River seines, and 13 other fresh-water seines. In all, there are 34 less than last year,\* of which 25 are gillnet fisheries. Each year fewer returns are received, so that we must infer either that the State is losing her fishermen, or that there is a decided neglect on their part to send in their returns.

There is an increase in the catch of sea-herring, flounders and flat-fish, eels, striped bass, and bluefish; but in the catch of most fish, as might be anticipated from the smaller number of returns, there is a falling off, as compared with the two preceding years.

Shad shows an increase of 2,539 over the catch of 1883. This increase is due entirely to the exceptional catch by the Newburyport sea seines. In the rivers there is a falling off in the number of shad caught. An Agawam fisherman, who caught only 54 shad, complains of the obstructions lower down in the Connecticut River, which prevent the ascent of the fish; but a South Hadley firm above him return 1,539 shad.

\* Three more returns have come in since this report went to press.

A large decrease in mackerel and menhaden is noticeable.

A Mashpee fisherman records his observations that the herring, though plentiful, are only half grown this year.

#### SALMON AND TROUT.

The importance of specific knowledge of the salmon and trout of the country, in connection with the many questions that arise in relation to the determination of the several species and varieties in the New England States, have led the Commissioners to request Mr. Samuel Garman to prepare a paper on the subject for publication in this report. Mr. Garman is an assistant in the Museum of Comparative Zoölogy, and has charge of the collection of fishes belonging to the museum, and thus has been able, in his studies, to use the large amount of material in the museum. He has been aided also by specimens sent him by the Commissioners of New Hampshire, and from the hatching houses at Plymouth. His paper is given in the appendix of this report, under the title of Notes and Descriptions of the Salmon and Trout of North America, with notices of the introduced species. The illustrations accompanying the paper were made under his personal supervision by Mr. Denton, and are considered to be accurate delineations of the several species and varieties native to or introduced into New England waters.

#### LEASED PONDS.

Less than one-half of the returns of the leased ponds have been received. Taken as a whole, they show a large increase over former years. There are a few complaints that the fish have not increased. This may be due, in part, to the unfavorable character of the water, but mainly to a lack of management. Of the 114 leased ponds, seven give a total return of 237,817 fish caught during the past season. Computing returns received, and estimating others on the basis of former returns, the total catch from the leased ponds for 1884 would be about 400,000 fish. As the weight is not generally given, it is not easy to estimate the marketable value.

The inland fisheries, during the last ten years, have not only held their own against the demands of a growing population, but have steadily increased. What they would have been, had there been no effort to arrest their downward tendency, can be easily seen by any one who will give the subject a careful consideration.

E. A. BRACKETT.

F. W. PUTNAM.

EDWARD H. LATHROP.

## EXPENSES OF COMMISSION.

---

Salary, . . . . .	\$1,650 00
Travelling expenses, . . . . .	202 63
	<hr/>
	\$1,852 63

## GENERAL EXPENSES.

Postage, telegrams, and expressage, . . . . .	94 25
Printing, . . . . .	64 70
Hardware, . . . . .	12 72
Fish food, . . . . .	31 37
Trout spawn, . . . . .	100 00
E. B. Hodge, services as Supt. joint hatchery, . . . . .	300 00
Assistant, services as Supt. joint hatchery, . . . . .	67 50
Rent, joint hatchery, . . . . .	50 00
Legal services, Fred. Williams, . . . . .	28 00
Serving notices, deputy sheriff, . . . . .	10 12
Rent of land for hatching house, . . . . .	50 00
Subscription to fund of Penobscot salmon breeding establishment for 1884 and 1885, . . . . .	400 00
Subscription to fund of Schoodic salmon breeding establishment, . . . . .	400 00
E. F. Hunt, services and expenses, . . . . .	457 25
B. P. Chadwick, services and expenses at North Andover shad hatchery, . . . . .	64 11
E. S. Robinson, services and expenses at North Andover shad hatchery, . . . . .	21 00
John L. Murphy, services and expenses at North Andover shad hatchery, . . . . .	21 00
Robert Elliot, services and expenses at North Andover shad hatchery, . . . . .	42 00
Patrick Barrett, services and expenses at North Andover shad hatchery, . . . . .	15 00
J. C. Walker, services and expenses at State hatchery, . . . . .	20 00
Expense planting salmon, . . . . .	10 00
D. L. Withington, legal services and expenses, . . . . .	22 79
Thomas S. Holmes, labor at Lawrence fishway, . . . . .	70 00
Total, . . . . .	<hr/>
	\$4,203 99



---

---

## APPENDIX.

---

---





[A.]

LIST OF FISH COMMISSIONERS.

DOMINION OF CANADA.

[We have had no notice of any appointment to the office vacated by Mr.  
W. F. Whitcher.]

PROVINCE OF NEW BRUNSWICK.

W. H. Venning, Inspector of Fisheries, . . . St. John.

PROVINCE OF NOVA SCOTIA.

W. H. Rogers, Inspector, . . . Amherst.

PROVINCE OF PRINCE EDWARD ISLAND.

J. H. Duvar, Inspector, . . . Alberton.

PROVINCE OF BRITISH COLUMBIA.

A. C. Anderson, . . . Victoria.

THE UNITED STATES.

Prof. Spencer F. Baird, . . . Washington, D. C.

ALABAMA.

Col. D. R. Hundley, . . . Mooresville.

Hon. C. S. G. Doster, . . . Prattville.

ARIZONA.

Hon. J. J. Gosper, . . . Prescott.

Hon. Richard Rule, . . . Tombstone.

J. H. Tagart, Business Manager, . . . Yuma.

ARKANSAS.

James H. Hornibrook, . . . Little Rock.

H. H. Rottaken, . . . Little Rock.

CALIFORNIA.

J. D. Redding, . . . San Francisco.

A. B. Dibble, . . . Grass Valley.

B. H. Buckingham, . . . Washington.

## COLORADO.

Wilson E. Sisty, . . . . . Idaho Springs.

## CONNECTICUT.

Dr. W. M. Hudson, . . . . . Hartford.  
 Robert G. Pike, . . . . . Middletown.  
 James A. Bill, . . . . . Lyme.

## DELAWARE.

Enoch Moore, Jr., . . . . . Wilmington.

## GEORGIA.

Hon. J. T. Henderson, Commissioner of Agriculture, Atlanta.  
 Dr. H. H. Cary, Superintendent of Fisheries, . . . La Grange.  
 Under the laws of the State these two constitute the  
 Board of Fish Commissioners.

## ILLINOIS.

N. K. Fairbank, President, . . . . . Chicago.  
 S. P. Bartlett, . . . . . Quincy.  
 S. P. McDole, . . . . . Aurora.

## INDIANA.

Calvin Fletcher, . . . . . Spencer, Owen Co.

## IOWA.

A. W. Aldrich, . . . . . Anamosa.  
 A. A. Mosher, . . . . . Spirit Lake.

## KANSAS.

W. S. Gile, . . . . . Venango.

## KENTUCKY.

William Griffith, President, . . . . . Louisville.  
 P. H. Darby, . . . . . Princeton.  
 John B. Walker, . . . . . Madisonville.  
 Hon. C. J. Walton, . . . . . Munfordville.  
 Hon. John A. Steele, . . . . . Versailles.  
 W. C. Price, . . . . . Danville.  
 Dr. W. Van Antwerp, . . . . . Mt. Sterling.  
 Hon. J. M. Chambers, . . . . . Independence, Kenton Co.  
 A. H. Goble, . . . . . Catlettsburg.  
 J. H. Mallory, . . . . . Bowling Green.

## MAINE.

F. M. Stilwell, . . . . . Bangor.  
 Henry O. Stanley, . . . . . Dixfield.

## MARYLAND.

G. W. Delawder,	.	.	.	.	.	.	Oakland.
Dr. E. W. Humphries,	.	.	.	.	.	.	Salisbury.

## MASSACHUSETTS.

E. A. Brackett,	.	.	.	.	.	.	Winchester.
F. W. Putnam,	.	.	.	.	.	.	Cambridge.
Edw. H. Lathrop,	.	.	.	.	.	.	Springfield.

## MICHIGAN.

Dr. J. C. Parker, President,	.	.	.	.	.	Grand Rapids.
John H. Bissell,	.	.	.	.	.	Detroit.
Herschel Whitaker,	.	.	.	.	.	Detroit.

## MINNESOTA.

1st District—Daniel Cameron,	.	.	.	.	La Crescent.
2d District—William M. Sweeney, M. D.,	.	.	.	.	Red Wing.
3d District—Robert Ormsby Sweeny, President,	.	.	.	.	St Paul.

## MISSOURI.

John Reid,	.	.	.	.	.	Lexington.
J. G. W. Steedman, Chairman,	.	.	.	.	2803 Pine Street, St. Louis.	
Dr. J. S. Logan,	.	.	.	.	St. Joseph.	

## NEBRASKA.

R. R. Livingston,	.	.	.	.	.	Plattsmouth.
William L. May,	.	.	.	.	.	Fremont.
B. E. B. Kennedy,	.	.	.	.	.	Omaha.

## NEVADA.

Hon. Hubb G. Parker,	.	.	.	.	.	Carson City.
----------------------	---	---	---	---	---	--------------

## NEW HAMPSHIRE.

George W. Riddle,	.	.	.	.	.	Manchester.
Luther Hayes,	.	.	.	.	.	South Milton.
Elliott B. Hodge,	.	.	.	.	.	Plymouth.

## NEW JERSEY.

Richard S. Jenkins,	.	.	.	.	.	Camden.
William Wright,	.	.	.	.	.	Newark.
Frank M. Ward,	.	.	.	.	.	Newton.

## NEW YORK.

Hon R. Barnwell Roosevelt, President,	76 Chambers Street, New York.
Gen. Richard U. Sherman, Secretary,	New Hartford, Oneida Co.
Eugene G. Blackford,	809 Bedford Avenue, Brooklyn.
William H. Bowman,	Rochester.

## NORTH CAROLINA.

S. G. Worth, . . . . . Raleigh.

## OHIO.

Col. L. A. Harris, President, . . . . . Cincinnati.  
 Charles W. Bond, Treasurer, . . . . . Toledo.  
 George Daniel, Secretary, . . . . . Sandusky.

## OREGON.

A. B. Ferguson, . . . . . Astoria.

## PENNSYLVANIA.

John Gay, President, . . . . . Greensburg.  
 James Duffy, Treasurer, . . . . . Marietta.  
 H. H. Derr, Secretary, . . . . . Wilkesbarre.  
 A. M. Spangler, Corresponding Secretary, . . . . . Philadelphia.  
 Arthur Maginnis, . . . . . Swiftwater, Monroe Co.  
 Aug. Duncan, . . . . . Chambersburg.

## RHODE ISLAND.

John H. Barden, . . . . . Rockland.  
 Henry T. Root, . . . . . Providence.  
 Col. Amos Sherman, . . . . . Woonsocket.

## SOUTH CAROLINA.

Hon. A. P. Butler, Commissioner of Agriculture, . . . . . Columbia.  
 C. J. Huske, Superintendent of Fisheries, . . . . . Columbia.  
 These two officers constitute the Fishery Commission.

## TENNESSEE.

W. W. McDowell, . . . . . Memphis.  
 H. H. Sneed, . . . . . Chattanooga.  
 Edward D. Hicks, . . . . . Nashville.

## TEXAS.

John B. Lubbock, . . . . . Austin.

## VERMONT.

Hiram A. Cutting, . . . . . Lunenburg.  
 Herbert Brainerd, . . . . . St. Albans.

## VIRGINIA.

Col. Marshall McDonald, . . . . . Berryville.

## WASHINGTON TERRITORY.

Albert B. Stream, . . . . . North Cove.  
 (Term expired Nov. 9, 1877; no notice of reappointment.)

## WEST VIRGINIA.

H. B. Miller, President,	.	.	.	.	.	.	Wheeling.
C. S. White, Secretary,	.	.	.	.	.	.	Romney.
N. M. Lowry,	.	.	.	.	.	.	Hinton.

## WISCONSIN.

The Governor, *ex officio*.

Philo Dunning, President,	.	.	.	.	.	Madison.
C. L. Valentine, Secretary and Treasurer,	.	.	.	.	.	Janesville.
J. V. Jones,	.	.	.	.	.	Oshkosh.
J. F. Antisdel,	.	.	.	.	.	Milwaukee.
Mark Douglas,	.	.	.	.	.	Melrose.
C. Hutchinson,	.	.	.	.	.	Beetown.

## WYOMING TERRITORY.

Dr. M. C. Barkwell, Chairman,	.	.	.	.	.	Cheyenne.
Otto Gramm, Secretary,	.	.	.	.	.	Laramie.
N. L. Andrews,	.	.	.	.	.	Buffalo, Johnson Co.
E. W. Bennett,	.	.	.	.	.	Warm Springs, Carbon Co.
P. J. Downs,	.	.	.	.	.	Evanston, Uinta Co.
T. W. Quinn,	.	.	.	.	.	Lander, Sweetwater Co.

[B.]

## ADDRESS

OF

HON. THEODORE LYMAN,

PRESIDENT OF THE AMERICAN FISH CULTURAL ASSOCIATION,

AT THE THIRTEENTH ANNUAL MEETING, HELD IN THE NATIONAL  
MUSEUM, WASHINGTON, D. C., MAY 13TH, 1884.

Old Rondelet wrote a great work at the beginning of the sixteenth century on sea-fishes. His breadth of view included under the term "Fishes" almost every living thing that he found in salt water. It is in relation not to a fish, but to the radiated Medusa-head, that he uses these fine words, more familiar, perhaps, to our older naturalists than to those of the rising generation: *Immensa et summe admirabilis dei potentia atque solertia in rebus cœlestibus iisque quæ in aere et terra fiunt, maxime vero in mari, in quo tam variæ et stupendæ rerum formæ conspiciuntur ut quærendi et contemplandi nullus usquam futurus sit finis.*—"Vast and highly admirable are the power and skill of God in things heavenly and earthly, and in those of the air, but more especially in the sea, where are beheld shapes so various and stupendous that the study and contemplation of them shall never end."

He spoke thus in a spirit of prophecy. Three centuries have passed and we are still contemplating and investigating the things of the sea. We have skimmed its surface with muslin nets in search of its infusoria, and we have let down dredges and scraped its valleys three miles deep, and still the shapes various and stupendous continue to multiply. The more workers there are the more work remains to be done. Humble clams, worms and urchins take on great importance and become marine Sphinxes, asking riddles that no one can answer. Creatures that once were conveniently dismissed as gelatinous, or gristly, now advance claims to an intricate circulatory system, to muscular fibres and to nervous ganglia. Nay, they proudly look down on the vertebrates, in the matter of reproduction, as they pass gracefully through the varied stages of alternate generation and self-division.

Rondelet lived near a sea whose inhabitants were well calculated to excite his wonder and delight. He was professor of medicine at Montpellier, not many miles from Aigues-Mortes, the port whence St. Louis embarked for his crusade, and whose walls, now surrounded by dry land, were in the middle of the sixteenth century still bathed by the waters of the Mediterranean. The shallows of the bay teemed with the smaller crustacea and shells, while the open sea beyond was then, as now, the home of many fishes, varied in form and brilliant in color, — the whiting, the red mullet, and the tunny, celebrated by classic writers. There, too, were found the darting squids and the great-eyed octopus, while from its depths came the rosy coral.

In the ancient medical school of Montpellier still hangs the portrait of Rondelet in his red gown. He has the grave and placid look of a man who was master of his studies, and who stood well with science and with the Church. For had he not, as a patron, Bishop Pelicier? and was he not the first authority in zoölogy and medicine, at a time when a good scholar could acquire all that was known of these and many things beside?

Every gain in knowledge has a loss that balances it. As the current of human thought grows wider, it becomes also more shallow, and splits into that infinitude of little channels which now are called specialties. In each of these channels may be seen a diligent investigator urging forward his little skiff, and well content to be navigating what to him seems the great river of truth.

Learning has grown so great in our day that the genius of one man can grasp no more than a part of it; so that in proportion as learning becomes larger, generalization, which is the final end of learning, grows more difficult. Worse than this, the mind employed on particular investigations gets unsymmetrical. The side that is used is strengthened; the disused side fails, and there results a scholar who believes in one set of ideas only.

After all, then, we must look with a certain envy at the state of mind of old Rondelet. Like most men of his age, he had that richness of thought and expression which comes of many-sided culture, and a strong faith in things both material and immaterial. When he said "*Dei potentia*," he distinctly meant power of God, and not "*potentialities*" or "*molecular environment*" or "*power that works for righteousness*," or any of those modern euphuisms which taste in the mouth like weak boiled arrow-root. Nevertheless, if we look closely, we can find the beginnings of that skepticism which plays so great a part in our day. For both he and his Bishop Pelicier were strongly suspected of favoring the Reformation. As to his colleague, Rabelais, he was noted for his unortho-

dox opinions, and went so far as to describe the future life as a "great perhaps."

But it is high time to leave Rondelet; and turn our attention to his sea-fishes. Their importance was great then; it is greater now. We might know by analogy, did we not know by actual research, that fishes have ever been of the first importance for man's food. Their natural abundance and the easy capture of shallow species put them within the reach of the primitive savage. The skeleton of the pre-historic chief, found in the cave of Mentone, had as a head ornament a net strung with Trochus shells, showing that he had walked the beaches of the neighboring Mediterranean, whose waters doubtless furnished his food.

The shell heaps of Scandinavia and of America contain abundant bones of fish. Morton, of Merry Mount (1628), gives us a good idea how these shell heaps were formed, when he tells how the Indians came each year to the shore near Quincy, in Massachusetts, and there camped for a long time, feasting on the plentiful clams and lobsters, and alewives and striped bass, whose shells and bones combined with the camp offal to build those deposits that we call shell heaps.

In New England, it must have been the fish that furnished the surest support to the native savages. Even in the depths of its Arctic winter there was a chance to get eels, smelts and clams, and at the first approach of mild weather the waters teemed with abundance. "It (Pawtucket Falls) is excellently accommodated with a fishing place," wrote good Mr. Gookin in 1674, "and there is taken a variety of fish in their seasons, such as salmon, shad, lamprey eels, sturgeon, bass, and divers others. And this place being an ancient and capital seat of the Indians, they came to fish; and this good man (Mr. Eliot) takes this opportunity to spread the net of the Gospel to fish for their souls."

That child of Belial, Morton, of Merry Mount, as keen a sportsman as any of our Bohemian backwoodsmen, gives enthusiastic accounts of the abundance and excellence of the fish which were in the sea convenient to his house. He is the first author that mentions cod-liver oil, which now plays so beneficent though nauseous a part in medicine.

He writes: "The coast aboundeth with such multitude of codd that the inhabitants of New England doe dunge their grounds with codd, and it is a commodity better than the golden mines of the Spanish Indes. . . . Greate store of train oyle is mayd of the livers of the codd, and is a commodity that without question will enrich the inhabitants of New England quickly."



Almost coincident with the establishment of Plymouth Colony, we find laws concerning the fisheries, proof positive of the esteem in which they were held.

In 1633 was passed what I take to be the first law for the encouragement of fish-culture, in these words: "It is enacted by the Court . . . but if any man desire to improve a place and stocke it with fish of any kind for his private use, it shal bee lawfull for the Court to make any such graunt and forbid all others to make use of it."

In 1637 the same court enacted, with the contrary-mindedness of our Puritan forefathers, that six score and twelve fishes shall be accounted to the hundred of all sorts of fishes.

In 1670 it was set forth with pious teleology that "the providence of God hath made Cape Cod commodious for us, for fishing with seines"; implying that it might not be commodious for less religious persons. The act goes on to say that "careless persons" must not interfere with the said providence, "by leaving the garbage of fish to lie there."

The country had not been settled a half century before there was complaint of the diminution of fish. The act just quoted goes on to speak of the great inconvenience of taking mackerel at unseasonable times, whereby their increase is greatly diminished, and a law was passed prohibiting the catching of fish before they have "spauled." This shows that our ancestors were not more logical than most of their descendants, who still hold, that to take a fish when ripe for spawning is in some peculiar way destructive to the species. It is almost needless to say that fishes taken at any time of the year are killed before they have "spauled." The only reason that it is more destructive to take fish during the spawning season is because they are then tamer and are crowded together, so that greater numbers are likely to be captured.

The river fisheries, too, call aloud for protection. In 1709, it was enacted "That no weirs, hedges, fish garths, stakes, kiddles or other disturbance or encumbrance shall be set, erected or made on or across any river, to the stopping, obstructing or straightening of the natural or usual course and passage of fish in their seasons . . . without allowance first had, and obtained from the General Sessions of the Peace in the same county." This law especially applied to such fishes as run up the rivers to spawn, —salmon, shad and alewives. The Indians, in their day, were wont to construct weirs and the like obstructions to capture these fishes. But the Indians were few and were idle and wandering. They took only what was necessary for their present use. Now, however, had come the white men, who put up permanent abodes and in-

creased in numbers, year by year. They were money-makers, who worked every day and all the day. They would catch fish, not for themselves only, but to sell to strangers; and so they have gone on ever since. Pawtucket Falls, on the Merrimac, where the Apostle Eliot spread his net of the gospel, now furnishes the water power for the great manufacturing city of Lowell. And Merry Mount, to-day the country seat of John Quincy Adams, is a suburb of the metropolis of New England. The inhabitants no longer "dunge their grounds with codd," but are fain to buy that fish in the market at a round price per pound.

The river fish whose protection has cost most law-making in the old commonwealth of Massachusetts is the humble alewife. In contradiction of the proverb, "mute as a fish," this one may truly be said to have made a great deal of noise in the world. Like some men they are small and humble, but persistent and numerous. In the springtime the alewives stand in from the sea, and push up the smaller fresh-water streams, seeking ponds wherein to deposit their spawn. They come in great armies and insist on entering those ponds. Nothing less than a vertical wall six feet high will stop them. Amid the clatter of mill wheels, and in the very face of the sweeping scoop net, they force themselves through rapids, over falls, and by long underground drains, regardless of their perishing comrades, who by thousands fall a prey to the fishermen and to hawks and eagles, or who run themselves ashore in their frantic efforts to get on. It may be that only a few reach the spawning ground, and these are enough to keep up the race; for one female will lay a quarter of a million of spawn. They are, therefore, *par excellence* domestic and cultivable fish, and have been so regarded in Massachusetts for generations. As early as 1741, there was passed "An Act made to prevent the destruction of the fish called alewives," wherein it was provided that any owner of a dam "shall make a sufficient passageway, for the fish to pass up such river or stream, through or around such dam."

It is, however, not until 1790, that the alewife fishery of Taunton Great River first appears on the statute books, whose pages it was destined to encumber. If very few of my hearers know anything of Taunton Great River, the fact proves how miserably our system of popular education fails to instruct people concerning the most remarkable geographical features of the land. Taunton Great River was doubtless named in the spirit of contrary-mindedness already referred to as a characteristic in our Puritan ancestors. The unregenerate would be inclined to call it Taunton Small River, for it is a small stream, which heads in some ponds in the town of Lakeville, and after a short and quiet course empties into

the sea at Fall River. But not the mighty Mississippi itself bears on its bosom so great a mass of legislation. The great and general court of Massachusetts invariably spends a portion of each session in trying to regulate the fisheries of this stream. The fishermen of the upper waters always complain that those of the lower waters get all the alewives, while those of the lower waters maintain that their rivals feloniously conspire to shut the fish off from their spawning grounds. And when by some special providence, both sets of fishermen are at peace with one another, they invariably make a combined attack upon the regulations of the State Fish Commissioners. The riparian inhabitants of other alewife streams, although not so combative, are quite as much interested as those of Taunton Great River. Indeed it was in such waters that a sort of fish-culture first grew up. In some cases where a dam owner wished to save his water power by shutting up his fishway, he would agree to catch each year so many thousand alewives at the foot of the dam, and to convey them alive to the mill pond above, and thus to keep up the crop. And it has been the custom for more than a century to regulate these little streams by special acts which govern the public sale of the fish, the days on which they may be netted, and the fishways that are to be kept open for their passage. The law goes often so far into detail as to provide that each widow of the town shall have a barrelful for nothing. I have dwelt thus long on this humble fish, because its successful culture gives encouragement to attempt that of others more difficult.

I shall follow briefly the decline of the fisheries in New England, because it is there that an organized system of fish-culture first in this country took its origin. That region has two rivers of considerable size — the Connecticut and the Merrimac. Both rise in the cold streams of the White Mountains. The Connecticut, flowing south, empties into Long Island Sound, and the Merrimac, by a southeasterly course, reaches the Atlantic Ocean. A century ago both rivers abounded in shad, salmon and alewives, and would doubtless have continued for many years to give a fair yield in spite of over-fishing, had it not been for the erection of impassable dams, which were intended to give water-power to the manufacturers, or to furnish slack-water navigation to lumber rafts. As early as 1798, the Connecticut River was thus barred at a point just within the northern limit of Massachusetts, but it was not until 1847 that the Merrimac was in a like manner shut off by the great dam at Lawrence. In both cases the salmon, stopped on their passage to the spawning grounds, became extinct after a few years, while the shad and alewives, which could be bred in the lower waters, continued annually to revisit these rivers.

What happened on the Merrimac and Connecticut happened equally on almost every lesser stream in that region. The people of New England, lacking advantages for farming, turned all their attention to manufacturing. Water-power was then much cheaper than steam, so that before long there rose a dam wherever there was a fall great enough to turn a mill-wheel. Except some simple trenches for the passage of alewives, no fishways were then known. The complete ignorance of this subject may be illustrated by the great dam twenty-seven feet high at Lawrence. The charter of the company permitted the building of a dam, provided a pass were furnished for salmon, which should be satisfactory to the county commissioners. Before the dam was finished, a solemn council of the best ichthyological and engineering talent was held to determine what kind of a pass would be suitable. The council based its judgment apparently on the cheap wood-cut in the primary geographies of half a century ago, which represented a salmon briskly leaping over falls at least fifty feet high. At any rate, the salmon pass finally approved by the learned commissioners consisted of a simple plank trough, sloping from the crest to the foot of the dam, at an angle somewhat steeper than forty-five degrees. It is needless to say that the salmon declined to exhibit any of the feats of agility portrayed in the wood-cut of the primary geography.

There soon came to be a general feeling, and one under the circumstances quite natural, that manufacturers and fish mutually excluded each other, and so things were allowed to drift at their pleasure. The streams that emptied into salt water no longer furnished such abundant swarms of small fry as had in former days served to toll the sea fishes toward the land, while the passage of boats and steamers and the increase of population and of fishing tended to destroy or to scare away the fish of the small bays and coves. The balance of nature had thus been changed, and one part had reacted against another.

The steady diminution would have gone uninterruptedly on but for the revival of fish-culture.

The discovery of artificial impregnation of eggs is such a simple one that the only wonder is that it was not practised long ago. Country boys who watch the brooks in autumn know how trout deposit their eggs; and fishermen after hauling their seine ashore are familiar with the spectacle of spawn and milt flowing from the ripe fishes. It is more than likely that many persons have in the past times practised the artificial fecundation of ova. The process was described in 1420 by Dom Pinchon, a monk of the abbey of Réome. It was re-discovered by Jacobi, of Westphalia, in 1763, and several naturalists availed themselves of this method in their

embryological researches. Among others, Louis Agassiz, who, in 1838, hatched the impregnated eggs of Swiss white fish by tying them in a muslin bag, and sinking it on the margin of the lake of Neufchatel.

In 1843, two fishermen of the Vosges, Joseph Rémy and Antoine Géhin, not only hatched a large number of trout, but devised means of feeding them artificially. They succeeded in stocking several water courses in their neighborhood with these trout fry. Seven years later their results had become known to the scientific men in Paris. Napoleon the Third had already begun his elaborate measures for the material aggrandizement of France, and he took up fish-culture and the acclimatization of new animals among other schemes. He disliked the professors of the Garden of Plants, because of their Orleanist sentiments, and he set up a rival under the name of the Garden of Acclimatization, of which fish-culture was in some sort a branch. Its apostle was Professor Coste. With large appropriations from the central government he established at Huningue, near the Swiss frontier, a large and elaborate station for fish-culture. His enthusiasm was great. He estimated that the yield of fresh-water fishes in France was not worth more than \$1,200,000 annually, which he was confident could be raised by artificial fecundation to \$180,000,000. Like many another inventor, Professor Coste was doomed to opposition and disappointment. M. Rimbaud, Secretary of the Fishery Board of Marseilles, ridiculed what he called the unnatural water-culture. He said the machinery and labor for hatching and the artificial food would cost more than the fish would come to. He was not far from right. With plenty of money to work with, it was not difficult to build hatcheries, dig ponds, set up apparatus, and put in turbine wheels for pumping. The working of the establishment was more difficult. The spawn, collected at distant points and sometimes in a careless way, often failed to hatch. The fry, carefully placed in suitable pools, disappeared in a way considered mysterious until it was discovered that several large pickerel had found their way into the pools. The eminent engineers of the *ponts et chaussées* contended in vain with the waters of the Rhine, which sometimes backed up and flooded the pools and tanks, and anon receded, leaving the turbine wheels high and dry. Years rolled on, and Professor Coste was still struggling to make fish plenty in France, when the Prussian armies crossed the Rhine and appropriated Huningue to the use of the German Empire.

All these disappointed hopes had not been quite in vain. Many valuable experiments had been tried and precious information pub-

lished, and, above all, it had been discovered that certain things could not be done. Meanwhile, knowledge of these discoveries had crossed the Atlantic, and in 1853, Dr. Theodatus Garlick hatched the artificially impregnated eggs of trout. Three years later commissioners appointed by Massachusetts published a valuable report on the general subject of fish-culture, and attempted unsuccessfully to hatch trout. In the same year an admirable report on fisheries was written by the eminent scholar, George P. Marsh, who had been appointed a commissioner by the State of New Hampshire.

The true beginning of fish-culture, however, under the auspices of State governments, was in July, 1864, when New Hampshire and Vermont passed legislative resolves calling on Massachusetts to re-establish a free passage for migratory sea fish through the dams on the Connecticut and Merrimac rivers. To the late Judge Henry A. Bellows, of New Hampshire, this country owes the successful beginning of the undertaking. He was an advocate learned in the law and full of enthusiasm for the restoration of the former runs of salmon and shad in the cool waters of the Pemigewasset and the broad expanse of Lake Winnepiseogee. He appeared before a committee of the Massachusetts legislature, and by their recommendation two commissioners were appointed, of whom I had the honor to be one. This was in 1865. Within a year every New England State was represented by fishery commissioners. They were accustomed to assemble from time to time for the discussion of their mutual interests. These modest gatherings, whereat the assembled authorities failed not to test the excellence of their own fish, were the prototypes of the national gathering which we celebrate this evening.

The opening of the great dams by fishways led to several important results. In the first place the decision in the case of the Massachusetts Commissioners against the Holyoke Water Power Company, has settled the law in regard to the rights of migratory fishes in rivers. This decision, which was confirmed by the United States Supreme Court in 1872, sets forth that a river was a public way, and the passage of migratory fish in it a public right. Therefore, whoever builds a dam across a river must furnish a passage to its migratory fish unless expressly exempted by the legislature.

It thus became easy to open the streams, and hundreds of owners of dams, who, by adverse possession had considered themselves safe from intrusion, now found themselves obliged to construct fishways at their own expense.

The second important step was also a legal one. It was the passage in 1869, by Massachusetts, of an act to encourage the cul-

tivation of useful fishes, which was intended to embody in one law all necessary regulations. Before that time the fishery laws of that State, to the number of nearly four hundred, were for the most part special enactments. The new statute substituted general provisions. It established a board of fishery commissioners, and gave them suitable power; gave to the riparian proprietor the control of ponds not exceeding twenty acres in extent, and regulated the times and methods of taking fish.

In attempting to restock the Merrimac and Connecticut, the most difficult problem possible was the one first encountered, that of building a fishway which would carry salmon, shad and alewives over a vertical dam near thirty feet high. In this country we had nothing to go by save the salmon passes of Great Britain, or the little water-steps over the low continental dams. Through successive improvements we have now attained a fishway that will with certainty carry salmon, alewives and the common river fishes over the most difficult dams. But the shad, with his love of the broad, gentle stream, and his suspicion of artificial contrivances, still remains rebellious. There is, however, a strong belief that the ingenious Colonel McDonald will irresistibly inveigle the shad into his mysterious pass. It is, indeed, a truly Irish pass, in which more water runs in than runs out; and the steeper is the incline, the more rapidly the water runs up hill; so that a shad would think he was swimming towards Fortress Monroe when he was in reality going over the falls of the Potomac. From the outset, the Massachusetts Commissioners had foreseen that the building of fishways on the Merrimac River was but a half remedy. It was further necessary to breed salmon and place them in the upper waters, that they might thence descend to the ocean, and return as marketable fish to their native river. To obtain impregnated eggs of salmon was at that time a work of great difficulty and expense. In the autumn of 1866, Dr. W. W. Fletcher, of New Hampshire, placed 15,000 New Brunswick salmon eggs in the Pemigewasset; but it was not until 1872, that 16,000 young fry were let loose in its waters; and in 1873, 185,000. Occasional captures of salmon in nets at various points on Massachusetts Bay were soon after reported; and on the 31st of May, 1877, two full-grown salmon were discovered mounting the Lawrence fishway. Since that year, salmon have been artificially bred at the head waters of the Merrimac, and the full-grown fish have annually ascended a river in which for twenty-five years they have become extinct.

The other chief river of New England, the Connecticut, was the scene of the first artificial hatching of the shad. With the encouragement of the Massachusetts commissioners, Seth Green of New

York, began, in the summer of 1867, his experiments in shad hatching at Holyoke. His simple and ingenious invention of a hatching box, which kept up a constant current by floating, not horizontally but at an angle, has become a matter of familiar history. Great was the ridicule directed against Green, as he painfully waded about in the river under the hot July sun. But when, a few seasons later, the shad appeared in unusual numbers at the mouth of the river, ridicule was changed to admiration, and the great crop of that year was called "Green's shad."

In the following year, 1868, shad hatching was established on the Merrimac, and daily record was kept of the temperature of the air and water, of the number and sex of the fish taken, and the quantity of eggs hatched. These tables were the first of the kind published in this country.

The progress of this slight sketch has brought us to the question which underlies the subject of fish-culture in its broadest sense; it is the question of the possible exhaustion of great fisheries, and especially those of the sea.

We have seen that soon after the settlement of the country complaints of the decrease of fish began to arise. It is very likely that these complaints came rather from the accidental differences of seasons than from any real decrease. Nevertheless, they indicate that the relation between overfishing and decrease of the crop was one that was early suggested to our people. The entire subject was brought into prominence in our own day by the report of the English commissioners to inquire into the sea fisheries of the United Kingdom in 1864. Of these commissioners it has been said: "Their industry was so extraordinary, and the piles of evidence were such as to leave the impression that every fish-wife in the three kingdoms had had her say. The trawlers were vehement against the set-hook men, and the set-hook men were furious against the trawlers. The commission decided that they all were right, and might fish when, how and where they pleased, But just then Mr. Bertram comes out with his 'Harvest of the Sea,' in which, by fact and figure, he aims to show just the opposite; namely, that the open-sea fish had decreased by overfishing."

The question of the progressive exhaustion of sea fisheries came up six years later in America, in the form of a monster petition presented to the Massachusetts legislature, which was asked to pass a law restricting fishing with weirs, seines and gillnets. The petitioners alleged that valuable fishes, such as the scup, the tautog and the striped bass, were taken by the above-mentioned contrivances in so wholesale a way as to threaten their speedy extinction. The complaints applied chiefly to the southern waters,



including those of Narragansett Bay, where the inhabitants of Rhode Island were equally interested, and both States proceeded to investigate the subject. Their methods, however, were no better than had been those of the English commissioners, and consisted chiefly in the examination of numerous witnesses. It was the same story over again. The weir men swore against the hook-and-line fishermen, and the hook-and-line fishermen swore against the weir men. The moment had evidently arrived to abandon the methods of the court-room, and to take up those of scientific investigation.

To this end the Massachusetts commissioners, in the spring of 1881, hired a weir at Waquoit, on the south side of Cape Cod, and put it in charge of an observer, who kept a daily record of the fishes taken, of the wind and weather, and of the temperature of air and water. At the end of the season the results were embodied in a report entitled, "Third Notice upon the Possible Exhaustion of Sea Fisheries." It was shown by this investigation that the moment at which fishes leave the ocean to enter rivers is determined by the temperature of the water. It further appeared that these so called anadromous fishes are usually caught in weirs and in similar traps, when hurrying along the coast in their northward migrations, whereas those that arrive near or at the mouth of their native river, slacken their pace and cautiously feel their way, like a ship standing into a harbor. These last are more apt to avoid the nets ingeniously set for their capture.

Up to this time the movement in favor of fish-culture had been confined to New York and New England, and chiefly to the State of Massachusetts. Dams, hitherto impassable, had been opened to the passage of anadromous fishes; fish-ways of an improved form had been built; a decision of the Supreme Court had given to fish the right of way in rivers; acts for the encouragement of the cultivation of useful fishes had been passed; the artificial hatching of shad and salmon had begun, and an investigation into the exhaustion of sea fisheries had been set on foot. All these measures were, however, partial and on a small scale. The moment had arrived for the interposition of a power stronger and more general in its character.

That democratic and gregarious fish, the scup, was the founder of the United States Commission of Fish and Fisheries. It is a fish coeval with the first white settlements. In 1621, on the shores of Buzzard's Bay, the hungry Englishmen were entertained by Massasoit with "two fishes like bream, but twice as big and better meat"; and Roger Williams says, in 1642, "Mishcup, the bream. Of this fish there is an abundance, which the natives dry

in the sun and smoke, and some English begin to salt." With the first warm days of spring, the scup were wont to push into the bays and fiords and salt ponds in great multitudes, standing in from the off-shore depths which had sheltered them and furnished them abundant food during the winter. Then followed a jubilee for poor and rich. Anybody who had a hook and line could catch a "mess of fish" before breakfast; scup, he was sure to get, and he was likely to get a fat tautog or a striped bass. But when did a Yankee ever allow any peace either to himself or to his neighbor, or when did his mind, sleeping or waking, ever cease to dwell on the invention of some labor-saving machine? Hook and line was too primitive a method to be permitted in this age of improvement. About the year 1846, one Benjamin Tallman, being doubtless moved and abetted by the evil one, conceived the idea of driving posts in a straight line running out to sea, and stretching thereon netting so as to make a fence, and constructing at the end thereof a sort of enclosed yard. The schools of scup, as they coasted along the shore, ran against the fence, and turning their heads seaward, were captured in the said yard. The inventor, in the pride of his heart, named this engine a "trap." He little knew that he had only made a small copy of the contrivance that was known to the Phœnicians, who used it along the shores of the Mediterranean and even on the coast of Spain. There, in later days, the Moors called it the *almadraba*, whence is derived the modern French word *madrague*. If the Moors created as much popular indignation with their *almadrabas* as Benjamin did with his "traps," the fact may account for their expulsion from Spain by the Gothic tribes. For twenty years, war and recrimination prevailed between the trappers and the hook-and-line men, until, at length, both parties, like the Jewish factions, determined to appeal unto Cæsar, or as he is now called, Uncle Sam.

On the 19th of February, 1871, was passed a joint resolution of Congress, the preamble of which says: "*Whereas*, it is asserted that the most valuable food fishes of the coast and the lakes of the United States are rapidly diminishing in number, to the public injury, and so as materially to affect the interests of trade and commerce, *therefore, Resolved*, that the President be authorized to appoint a Commissioner of Fish and Fisheries."

It has been truly said that when the critical moment arrives, the man appears also; and this critical moment made no exception to the rule. A man — nay, *the* man — was at once found in the person of Professor Spencer F. Baird. The Cæsar to whom the warring factions had appealed could not have sent forth a more judicious prætor. Mercifully he was not one of those self-taught men

(of whom for some occult reason we are so proud), but a man of careful scientific training; and one as industrious in collecting facts as in arranging them. Also, was he a man of a pleasant countenance and conversation, and well calculated to assuage the irritated feelings of the hook-and-liner, or to soothe the exasperated nerves of the trapper. Indeed, he seems to be the only individual in history who ever intervened between two combatants without receiving the blows of both.

Henceforth the history of American fish-culture is contained in that of the United States Fish Commission. Its work, wide spread and pushed with extraordinary energy, attracted the attention of the whole country. A greater part of the States appointed fishery commissions, which co-operated with and were assisted by that of the general government. Its rapidly increasing value and power culminated in the great fishery exhibitions of Berlin and London, where the United States exhibits gained the chief prizes.

The history of the movement for the restoration of our fishes may seem like a triumphal march; but in summing up its results, we cannot in honesty avoid the cold question *cui bono?* of what good is all this?

Up to the year 1880, the fishery commissions of the States and of the general government had had appropriated \$1,306,378. Has the country got a return of a million dollars' worth of additional fish?

In 1880, the total value of the fishery products of the United States was \$43,000,000, a less sum than that of the manufactures in a single Congressional district in the little State of Massachusetts. The two products show that real value is not always to be measured by money. The people of this country could have been deprived of the manufactures of that district without recognizing their loss, but what an outcry would arise were they cut off, even for a month, from cod and white-fish, lobsters and oysters!

Did the expenditure of \$1,300,000, since 1866, add anything to the \$43,000,000 which our fisheries produced in 1880, or did it pave the way for an increase?

To answer these questions we must define what we mean by a decrease in fisheries.

When so many fish are annually taken from the waters that the remainder are not numerous enough to produce a new crop equal in numbers to the old one, there must be a progressive decrease in the yield. It is a very simple matter to demonstrate such a decrease in ordinary rivers or in lakes of moderate size, where it is easy to show that spearing and netting of the trout on their spawning beds has diminished their numbers, or that the establishment of weirs

has made white-fish scarce. In the bays and coves of the sea, also, where the waters are shallow, it is not difficult to show that the use of numerous fykes and trawl-lines destroy the local fish, like tautog, rock-bass and flounders. But, when we come to the schooling fishes of the open sea, it is very difficult to tell how much effect the hand of man has in lessening them. If, for example, we argue that traps and purse seines diminish the crop of menhaden by capturing them in enormous numbers, we leave out of mind the fact these same traps and purse seines also capture bluefish and small sharks, which are thus taken from their daily occupation of killing menhaden. Again, when menhaden entirely disappear from a long stretch of coast, they are, in reality, no scarcer than before. They refuse to come to their wonted waters, either because the temperature is too low, or because their favorite food is not to be found. They are not destroyed, only absent. There are familiar instances of such disappearances. The scup was plentiful when the whites first landed in New England; they afterwards disappeared, and reappeared about the beginning of the present century. The bluefish was caught on the southern coast of New England from 1659, for more than a hundred years. In 1764 they disappeared, and, after an absence of sixty-six years, they reappeared about 1830.

Another element that must be borne in mind in estimating the total catch of fish, is the number of men and the kind of engines employed. If, for example, the population of a coast is scanty, and only a dozen men go afishing, each of them is likely to have a good catch; but when the coast becomes thickly settled, a hundred men will fish, and though each one may take but few, the catch of the hundred will be much greater than that of the twelve.

In the light of the patient investigations of the past dozen years, it is safe to assert, first, that our fresh-water fisheries have, in general, greatly diminished since early times, and have, in some cases, been destroyed. Secondly, that the local coast fisheries have also to a greater or less degree diminished.

What have our fishery commissions done to remedy or to palliate these evils? It is fair to say that they have done a good deal, and are in a way to do more.

Their first, and perhaps most valuable service has been to excite universal interest in our fisheries, and to draw general attention to their importance. The second great step in advance has been the accumulation of a vast amount of accurate information concerning the numbers and variety of our fishes, their food, manner of breeding, condition of life, migrations and stages of growth. The third degree of progress has been fish-culture, which may be called negative and positive: negative, when obstructions to the increase of

fish, such as improper apparatus and impassable dams are removed; positive, when fishes are artificially bred, or when new species are introduced from distant countries.

It may be fairly said that both forms of culture have already given considerable results. Of the success of negative culture, a familiar example is that of the smelt, which, a few years ago, had grown scanty in numbers and small in size on the Massachusetts coast, because the breeding fish were captured in the brooks when crowded together on their spawning beds. The prohibition of this kind of fishing was followed within three years by the restoration of the smelts to their former numbers and size.

The best instance of positive culture is that of the California salmon in the Sacramento River, where Livingston Stone, by annually turning into the river 2,000,000 young fry, artificially hatched, increased the yearly catch from 5,000,000 pounds to 9,500,000 pounds.

Wide experience in the hatching of shad and white-fish proves pretty clearly that a marked increase may be obtained, if the work be done on a scale large enough, and that an amount of work insufficient to produce a positive increase will, nevertheless, check the decrease of these species.

In a word, artificial breeding, by greatly augmenting the proportion of eggs impregnated and by protecting them until hatched, presents a great advantage over the natural process, and gives us an available method of preserving many important fisheries. But to produce results of commercial value, this water-culture must be practised as universally and methodically as is agriculture.

It is not the custom of Americans to stop half-way in a profitable enterprise. Therefore I do not doubt that in the next generation some of our chief fisheries will be maintained by an established system of artificial culture.

Perhaps, in that day, the honorable guild of fishmongers will erect a monument of their gratitude, and will inscribe on its tablets the names of scientific men who have, in our time, labored to create a new industry.

[C.]

## FISHWAYS ON THE RIVER SIRE.

---

By A. LANDMARK, Government Inspector of Fisheries, Norway.

---

The salmon fishways at Sire have attracted considerable attention in the last few years, being the greatest undertaking of this description ever completed in the world. We accompany this article with an illustration of the larger and more complicated of the two fishways of which we are to speak — the one at the so-called Rukanfos, or upper Logsfos.

It is commonly believed that the main object of salmon fishways is to enable the greatest possible number of persons to share the profits of the salmon fisheries, by affording the owners, whose property is situated above the obstacles to be overcome by the fishway, an opportunity to participate in the salmon fishery. This belief, however, is far from being correct. If in building fishways this was the only object, it would not only be an unnecessary waste of time and money, but simply an injustice to the present owners of the salmon fisheries, as their legally attained rights, self-evidently, would suffer, when being compelled to share them with others. The true object in building salmon fishways is, much more, to increase the salmon by improving the conditions on which the reproduction of the fish is dependent. The salmon can only increase in rivers, where it can spawn late in the fall or early in the winter, in places where the river bottom is made up of fine gravel and where there is an even, somewhat swift, but not violent current. In many salmon rivers, places of this description are rare, especially near the mouth of the river, where the bottom usually consists of clay, mud, or fine sand, and the water is impure. When the salmon is confined to short stretches of river of this nature, it is forced to spawn in places, which, if not altogether injurious to the development of the fry, are, at all events, in great

measure unfavorable, and the inevitable result is that disproportionately great quantities of spawn are destroyed. And as every river is usually only frequented by the salmon hatched in it, the consequence is, that even great rivers will contain but a small number of salmon as long as desirable spawning grounds are so limited, or of unfavorable conditions. The spawn that is destroyed by such unfavorable circumstances, can easily be saved by fishways, as they enable the salmon to reach better and more extensive spawning grounds above the fall or dam that obstructed their further passage. Of course, it does not always hold good that a river contains better spawning places above the fall or dam than below; but as a rule, especially in the larger rivers, the conditions for hatching the spawn are better at some distance from the sea, both as to the quality of the river bottom and the purity of the water. It is self-evident that all these circumstances must be considered before building the fishway, and that any work of this kind is useless, unless some improvement of the natural conditions can be made. Good fishways, then, constructed in the proper places, will greatly improve the productiveness of a salmon river by augmenting the number of favorable spawning places.

The great results attained in this manner can be seen in other countries. In the Ballisodare river, on the northwestern coast of Ireland, where formerly no salmon was found, on account of an insurmountable waterfall at the very mouth of the river, they have succeeded, by using three fishways, in establishing a salmon fishery, valued at 50,000 kroner a year, considerably more than the value of salmon fishing in any Norwegian river. By far greater profits have been realized in other rivers of Great Britain and Ireland by building fishways and demolishing mill dams. But such splendid results can scarcely be looked for, except in countries where both the natural conditions of the land and the law in every instance furthers and protects the development of salmon fisheries.

Owing to the nature of our country, the falls in our rivers are so numerous, that places which can be reached by the salmon are very limited in extent. Although the area of England and Ireland is only about two-thirds of that of Norway, and the rivers of those countries are much more obstructed by dams, the total length of rivers in England and Ireland, favorable to the salmon, is about three and a half times as great as that of Norway, where the total length of salmon rivers is estimated by the Inspector of Fisheries to be 4,000 kilometers (2,485 miles). Hence there is a great field for fishways in our country, although many waterfalls are of such a nature that it is impossible to pass them. As yet

but little work of this kind has been done, and it is feared never will be done, as long as the state does not appropriate the sufficient funds.

Of all our fishways these of the Sire are the most extensive. Sire, situated between Lister, Mandals and Stavanger, is 146 kilometers (90 miles) in length. By nature it is accessible to the salmon only a few hundred meters above the brackish water, where we have the Logsfos, 8.5 meters (28 ft.) in height; 1,200 meters above there is another fall, Rukanfos, total height 27.2 meters (89 ft.). Both these falls can now be passed by fishways, whereby 70 or 80 kilometers more are made accessible to the salmon, and where several good spawning places are found, whereas formerly the naturally accessible were few and unfavorable. As a consequence the number of salmon in the river has always been small compared with its size. The fishways were designed jointly by the Inspector of Fisheries Landmark, and civil engineer G. Saetren, and executed during the summer and fall of 1880. The total cost has been 25,000 to 26,000 kroner. The fishway at Logsfos is of a very simple construction, consisting mainly of a 320 meter (1,050 ft.) long channel of considerable dimensions, dug on the eastern shore of the river. At the lower end, where the channel is conducted through a narrow ravine, traverses have been built to moderate the swiftness of the current. At both ends the channel is fitted out with special contrivances to secure its effectiveness and durability. In order to obtain a sufficient water supply at low water, without too extensive excavations, a dam has been thrown across the river just above the fall, whereby the water level is raised. As this dam is not quite completed, there is not water enough in the channel in very dry seasons. Much grander and more complicated is the fishway at the Rukanfos, represented in our engraving; it surpasses every work of its kind, both on account of the fall and the obstacles to be overcome. The total height of the fall is, as stated, no less than 27.2 meters (89 ft.), and the steep, wild cliffs that surround it on all sides, leave but little space for building a fishway. Further, the floods which occasionally occur are exceedingly violent, often causing the water to rise 6.6 meters (21.6 ft.) both at the foot and head of the fall. Extraordinary measures have been necessary in order to procure the necessary room to protect the works against the flood and make them useful at low water. The engraving gives a general view of the work, at the same time conveying an idea of the huge, very nearly perpendicular, mountain side that towers above the fall at its left. It will be seen how the lower part of the fishway is guarded by two immense stone



walls and, partly resting on one of them, winds up through the narrow ravine, until reaching a point from which it is continued in a more horizontal direction. The fishway, which is built of wood, except at the very top, where it is blasted into the stone, has a grade of 1 in 7 and 1 in 8, and is principally arranged according to an American system (E. A. Brackett's), with a few minor alterations. The other two engravings show its complicated arrangement, with the numberless current breakers which check the motion of the water in a very high degree, and at the same time making the ascent about three times as long for the salmon. The total length of this fishway is 285 meters (935 ft.), while the passage to be made by the salmon is 785 meters (about one-half mile); it is 2.82 meters in width, with a depth of 1.18 meters; depth of water about one meter. The punctuated cross-lines in the outline show the current breakers, fixed in the bottom of the channel to check the swiftness of the current. The greatest peculiarity about the fishway is the construction of the lowest part nearest to the mouth of the channel. To make the fishway more attractive to the salmon, a side channel, which lies nearly horizontally on top of the lower part of the way, has been constructed to increase the water; to keep the water from overflowing during a flood the walls are made considerably higher at the mouth, where they are no less than 4.2 meters high. The upper course has also some peculiarities of its own, consisting of a number of cross-dams, whose level is 0.4 meters lower than those opposite, and in each there is an opening at the bottom 0.89 meters square. The principal dam at the top is fitted out with a trap-door which can be opened and closed at pleasure. It has been seen that the salmon can now pass the fishway without any difficulty, notwithstanding that some improvements, to make the fishway more useful at very low water, still remain uncompleted. As the number of salmon in this river, owing to the lack of spawning places which are accessible to the salmon, was small when the fishways were constructed, some years must pass before the results of the labor can be seen. Only few salmon have so far passed up the fishway. When the remaining improvements have been completed, the undertaking will undoubtedly pay largely. At the upper part of the fishway a house for the artificial hatching of salmon has been constructed.

[D]

## THE BLACK BASS.

---

From "American Field."

---

There is, perhaps, remarks the Philadelphia "Ledger," no other food fish indigenous to American waters so widely distributed as the black bass. Originally its habitat comprised the whole of the United States east of the Rocky Mountains and from Canada to New Mexico, with the exception of the New England States and the Atlantic seaboard of the Middle States. Now it is to be found in nearly all the fresh waters of the continent, having been introduced into those in which it did not originally abound by private individual enterprise, and by the combined agencies of the National Fishing Commission and of the Fishery Commissioners of the various States.

Being a remarkably hardy fish, easy of transportation, transplanting has been generally successful; and, being in addition very prolific, it has multiplied immensely wherever the fishery laws have been respected, and in a great many instances where the legal statutes for its protection at certain seasons have been set at defiance.

Pennsylvania has been conspicuous for the number and extent of these violations, notwithstanding the stringency of the laws and the strenuous efforts of the State Fishery Commissioners to have them respected. Had the close seasons been observed as they should since bass were first introduced in our State, its waters would to day teem with these fine fish, and though no definite estimate as to the money value of such increase can be made, it is hazarding nothing to assert that it would be immensely large; for the black bass is aggressive, self-reliant, and abundantly able to care not for itself only but for its progeny also, and with every disposition to do so.

How rapidly they multiply can be learned from the facts connected with their introduction into the Potomac River. About the year 1854 thirty black bass taken from the Ohio River were placed in the canal basin at Cumberland, Md. Some of them, possibly all, escaped into the Potomac, and so remarkable has been their increase, that to-day, and for a number of years, the principal markets north have been supplied with bass from its waters. Notwithstanding these heavy drains upon its resources in that line, the bass do not appear to have diminished in numbers; on the contrary, the successively larger annual catches prove that they are growing more and more abundant, affording a comfortable livelihood to a great many professional fishermen, and rare sport to thousands of anglers.

The first successful attempt to introduce the black bass into Eastern waters was made in New England in 1850. This was followed by others, with equally encouraging results, until there is scarcely a lake, pond, river or creek east of the Alleghenies, that has not been stocked with them, and in which they are not constantly multiplying.

Pennsylvania was among the last of the Atlantic States to give the subject attention. It was not until 1869 that a private citizen placed some black bass in the Susquehanna at Harrisburg. These increased rapidly. At many points on that river they are now caught in fair numbers and frequently of large size.

In 1873 the State Fishery Commissioners, deeply impressed with the merits of the black bass as a food fish, and the special adaptation of the streams of the State to it, supplied thirty-five different points in the tributaries of the Potomac, Susquehanna and Delaware rivers. In nearly every instance—presumably in all—these plantings proved successful, as the bass delights most and thrives best, and perhaps only, in clear, pure water, avoiding that which is stagnant or sluggish. Whenever, therefore, even moderately fair opportunities have been afforded them, they have well repaid the trouble and cost of their transplanting. Were it possible to secure for them entire immunity from interference by net fishermen, anglers, dynamiters and others bent upon their destruction, for five years only, the increment would be so great as to largely augment the present animal food supply. The people of the State, at least the many who have been most eager and most successful in taking them, in season and out of season, do not appear to have a proper appreciation of this fact; hence every device that could possibly be employed for their taking has been brought into requisition; and for this reason the increase in the waters of the State

— the natural advantages considered — has not been as great as in States where greater respect has been paid to the fishery laws.

The new Board of Fishery Commissioners has, it is understood, resolved to make special and much more vigorous efforts to secure a better enforcement of existing laws, and if possible to secure such additional legislation as may be needed to carry its intentions into full practical effect.

The habits of the black bass furnish very interesting subjects for study. These fish spawn from February until after midsummer, the time depending upon locality, the temperature of the water, etc. Leaving the deep water early in the spring, they resort to the shallower, where they pair off for breeding, generally selecting for their spawning beds gravelly or rocky bottom, and water from eighteen inches to three feet in depth, though at times water of greater depth is chosen. The eggs are usually deposited on the bottom in rows, and being fecundated by the male, stick to whatever substance may be found there. They are hatched in about a fortnight, sometimes less, the time depending upon the depth of the water and the temperature. The parent fishes maintain a vigilant watch over the spawn, driving off intruders. They keep the water in the vicinity of the eggs in constant motion, by a continuous gentle motion of their fins, in order to prevent impurities from settling upon them. After the eggs are hatched the vigilance of the parent fishes appears to be redoubled. The young emerge from the egg almost perfectly formed, and remain on the bed from three to six days, when they seek deeper water, or places where they can readily take refuge from the pursuit of enemies. The parental guardianship is maintained until the young fry are able to take care of themselves. They grow rapidly, attaining, when food is plentiful and of the right kind, the weight of a pound during the first year, the annual increase thereafter being about in the same proportion until the maximum, which is from five to six pounds, is reached, though heavier ones of the small-mouthed variety are claimed to have been caught. Large-mouthed bass of Funda have been taken weighing sixteen pounds.

There are few fresh-water fishes more palatable than the black bass. Its flesh possesses the desirable qualities of firmness, flakiness and whiteness, combined with solidity, proper juiciness and rich flavor. As a pan fish, it is fully equal to the well-known sea bass, and the larger ones are by many as greatly esteemed for boiling or baking as sheephead. Taken as a whole, when properly served, it has few superiors, and if the salmon and brook trout are excepted, probably none. It is cosmopolitan, thriving equally well

North and South, demanding only pure water, plenty of it, and to be let alone during its spawning seasons.

Viewing the black bass from a sporting standpoint, it has everything to commend it to the favorable consideration of those who delight in what may be termed game angling, though there are a great many who hold in thorough contempt the idea that there can possibly be any true sport in angling for any other fish than the salmon or the speckled trout. It would hardly be fair, because of the great disparity in size, to compare the former with the black bass; but when the taking of trout is contrasted with bass fishing, only those who have not had experience with both will insist upon according a preference to the former. The respective merits of the two as game fish have been widely discussed of late years, with a decided leaning toward the bass, as their game qualities become more thoroughly understood. The trout is as full of pluck and decidedly more beautiful than the bass, and is withal a brave and honorable fish. It fights to the last gasp, and yields only when unable longer to resist. But trout of a respectable size are becoming rare and difficult to find. The relentless pursuit of them has nearly depleted the waters in which they once abounded, so that only those who can afford to take long and expensive trips are afforded opportunities for honest comparison. But, conceding to the trout all that is claimed for it, there is no disputing the fact that the black bass, though less comely in appearance, is fairly its equal in point of gaminess. It has been called "the hog of the waters," though it is not easy to appreciate the title, unless because of the voracious disposition of the bass. More powerful in the water than the trout, more democratic in its tastes, fully as stubborn in its resistance when impaled on the hook, and more dashing and vigorous in its struggles for freedom, the angler finds in it a combatant of bull-dog proclivities, and one whose rapid reproduction and constantly increasing plentifulness fully entitles it to the hearty welcome it is receiving on every side; not the least of its merits being the solidity, sweetness, juiciness and tenderness of its flesh when properly cooked.

The black bass is a voracious feeder. It is charged with being the Ishmael of the fresh waters, one of the most heinous of its alleged offences being that it wages unceasing war upon smaller fish of almost every variety.

The black bass, although not an indiscriminate feeder, is not at all capricious in its tastes. Impetuous and fierce in its assaults upon whatever has the appearance of provender, it is readily taken with artificial flies, the varieties of which are almost endless. Artificial lures of the most novel forms are also used. Prominent

among these Protean devices, and perhaps the best, is what is known as the spoon-bowl, with its single hook. Those who desire to know how large is the number and variety of these traps for black bass must visit the establishments where such tackle is sold and see for themselves.

Perhaps the most attractive natural bait for black bass is the live minnow. While experts at bass fishing insist upon the superiority of certain kinds of small fish for bait—the preference being given to those of the most silvery appearance—the tastes of the black bass are so nearly omnivorous in regard to minnows that it will readily take almost any that may be offered. Catfish from four to five inches in length, although not silvery in appearance, have been found taking bait in almost any water. Just here it is proper to remark that the angler will find profit in the use of large minnows, as a bass of seven or eight inches will readily take in a minnow of four or five.

The helgramite, a repulsive looking creature, the larva of an insect of the neuropterous order, is a capital bait, as is the craw or cray fish. Both are found in nearly all our fresh waters. Young frogs are at times almost irresistible, as are grasshoppers and crickets. Young catfish, and, when they can be procured, “mud-dabblers,” a small fish plentiful in the vicinity of Baltimore, are in great request among the Susquehanna bass anglers.

At seasons when natural live bait is not easily procurable the common earth-worm is used, and generally with success. Live shrimps are also a taking lure.

[E.]

## THE AMERICAN SALMON AND TROUT,

*Including Introduced Species.*

BY S. GARMAN.

“A short paper that shall enable us to identify the different species of salmon and trout that belong here, or that have been introduced” is one not easily supplied. Among fishes there is probably no group of its size that presents more difficulty in determination than theirs, the genus *Salmo*. Short descriptions that shall distinguish are almost impossible in many cases, without the aid of illustrations. A number of the species noted here have been supplied with outline figures, indicating certain shapes and markings on which stress has been laid in the text. It remains to supply a few definitions and explanations to make the work still more available for those not accustomed to the technical terms of the ichthyologist.

The foremost fin on the back is known as the *Dorsal* (D.), and the little fatty fin behind it as the *Adipose*; the tail fin is the *Caudal*; that behind the vent is the *Anal* (A.); the pair before the vent are the *Ventrals* (V.), and those close to the gills are called the *Pectorals* (P.) Between the ventral fins and the body there are little pointed scale-like appendages called *Ventral bracts*, one to each fin. The hinder part of the cheek forms the gill cover or *Opercle*. The *Branchial rays* are series of ten or more blade-like bony pieces on each side of the throat below the Opercles. A narrow elongate strip of bone on the upper jaw reaching past the corner of the mouth under the eye is the *Maxillary*. The *Vomerine Teeth* are in the middle of the roof of the mouth; in some species they form a small group just behind the front series between the forward ends of the Palatines, which lie toward the sides of the roof next the Maxillaries; in others they are continued backward for a shorter or longer distance in one or two rows. The *Lateral line* is a line of *Pores* and enlarged scales along the middle of the flank from head to tail.

The Head is measured from the snout to the end of the gill cover, on the side.

In counting the scales a longitudinal line is taken from the upper angle of the gill opening, the beginning of the line of pores, directly back to the caudal fin, keeping a short distance above the larger scales of the lateral line. Transverse series are counted from the dorsal to the lateral line, from the latter to the ventral, and again from the adipose fin to the same line. All of the *Fin rays*, bony supports of the fins, short and long, are counted.

B., 11; D., 14; A., 13; V., 9; P., 14, reads thus: Branchial rays, 11; rays in the dorsal fin, 14; in the anal, 13; in the ventral, 9; and in the pectoral, 14.

Scales, 40, 238, 43, reads: Scales from dorsal to lateral line, 40; from head to tail, 238; and from lateral line to ventral, 43.

The *Pyloric cæca* are a lot of tubes, closed at the outer end and attached by the other, at the lower end of the stomach on the intestine. So much for the terms used.

The descriptions and outlines have been taken from specimens of particular sizes. When larger or smaller examples are compared with them it will be necessary to make certain allowances on account of variation. If the fish is younger it will be more slender, its head and snout shorter, its eye comparatively larger, its maxillary shorter, and its tail more deeply notched; if older, its body will be deeper, its head and snout longer, its eye comparatively smaller, its maxillary longer, and its caudal notch less deep. Besides these, the longer snout—hooked and distorted in some—the longer maxillary and higher coloration of adult and old males, as compared with females, is to be kept in mind. Owing to lack of specimens of the young of a number of the species for comparison, the coloration of the “parr” or banded stage has not been dwelt upon.

When all these variations are considered it will be seen that to make a complete description of a single species would take nearly as much space as has been allotted to this paper. In view of the prospect of confusion in future, from interbreeding and introductions, such descriptions would be especially desirable; but, at present, from lack of material—series of specimens of each sex, from very young to very old, and of the different varieties of each species—they are impossible.

The genus *Salmo* includes all of the salmon and trout. It is characterized by the shape of the body, elongate fusiform; the scales, small to medium, absent on the head; the mouth, medium to wide; the maxillary, extending under or behind the eye; the small conical teeth, on the jaw-bones, the vomer, the palatines, and the tongue; the anal fin, of eleven to nineteen rays; the numerous



pyloric cæca; and the transverse bands, "parr marks," in the young.

Different authors have subdivided the genus into *Oncorhynchus* (the Pacific salmons), having more than fourteen rays in the anal fin, and teeth on both head and body of the vomer; *Salmo* (the salmons), having less than fifteen anal rays, and teeth on both head and body of the vomer; and *Salvelinus* (the charrs or trout), having less than fifteen anal rays, and teeth on the head of the vomer but none on its body.

The list below gives the species included in this paper. Larger collections and further study will be likely to reduce the number among those from the Arctic regions, and possibly those of the Pacific, by putting two or more together as one.

#### SALMO.

<i>Oncorhynchus.</i>	<i>Salmo.</i>	<i>Salvelinus.</i>
<i>S. gorbuscha.</i>	<i>S. salar.</i>	<i>S. namaycush.</i>
<i>S. keta.</i>	<i>S. irideus.</i>	<i>S. siscowet.</i>
<i>S. tshawytscha.</i>	<i>S. gairdneri.</i>	<i>S. oquassa.</i>
<i>S. hisutch.</i>	<i>S. clarkii.</i>	<i>S. naresii.</i>
<i>S. nerka.</i>	<i>S. virginalis.</i>	<i>S. arcturus.</i>
	<i>S. lewisi.</i>	<i>S. malma.</i>
	<i>S. henshawi.</i>	<i>S. fontinalis.</i>
	<i>S. levenensis.</i>	<i>S. agassizii.</i>
	<i>S. fario.</i>	<i>S. hoodi.</i>
	<i>S. salvelinus.</i>	<i>S. rossi.</i>
		<i>S. nitidus.</i>
		<i>S. alipes.</i>
		<i>S. stagnalis.</i>

#### SALMO GORBUSCHA. *Humpback Salmon.*

*Salmo gorbuscha* Walb., 1792, Art. Gen. Pisc., 69: *Salmo proteus* Pallas, 1831, Zoogr. Ross. Asiat., III, 376; Suckley, Monogr. Salmo, 97; Jord., 1878, Pr. U. S. Mus., I, 71: *Salmo gibber* Bl. Schneid., 1801, 409.

*Salmo scouleri* Rich., 1836, F. Bor. Amer., III, 158: *Oncorhynchus proteus* and *O. scouleri* Gunther, 1866, Cat., VI, 157, 158: *Oncorhynchus gorbuscha* Jord., 1883, Bull. 16, U. S. Mus., 305.

B., 12 to 13; D., 14 to 15; A., 17; pyloric cæca, 180, more or less; scales small, 33, 210 to 240, 40; lateral line, 170; adipose fin to lateral line, 18.

Slender to moderately stout. Breeding males with a fat hump between the head and the dorsal, the jaws much produced and hooked, and with large teeth in front. Vomerine teeth in a double series. Maxillary slender, straight, extending behind the orbit; longer in the male. Ventral bract half or more of the length of the fin. Readily distinguished from other salmon of its region by the very small scales.

Silvery; back bluish, spotted posteriorly and on the tail with small spots of black. Males in season reddish, with brown markings.

This species attains a weight of five or six pounds. It occurs in the Northern Pacific, from California to Northeastern Asia. From descriptions.

#### SALMO KETA.

*Salmo keta* Walb., 1792, Art. Gen. Pisc., 72; Bl. Schneid., 1801, p. 407: *Salmo lagocephalus* Pallas, 1831, Zoogr. Ross. Asiat., III, 272: *Oncorhynchus lagocephalus* Gunther, 1866, Cat., VI, 161; Jord., 1883, Bull. 16, U. S. Mus., 305.

B., 13 to 14; D., 12; A., 16 to 17; pyloric cæca, 140 to 185; scales about 28, 150, 30.

A stout-bodied salmon, reaching a weight of twelve pounds; resembling the Quinnat in shape. Head perhaps a little longer than that of the latter, and broader about the snout. Maxillary extending considerably behind the eye. Ventral bract not half the length of the fin.

Brownish above, sides lighter. Sprinkled with small punctulations, often absent. Tail brownish, plain, or sprinkled like the back, edge blackish. Varying from light to very dark. Males in season with red color and markings on the flanks, becoming much distorted about the jaws, and deteriorating in quality of flesh. California to Kamtschatka. Not one of the best for introduction.

#### SALMO TSHAWYTSCHA. Quinnat Salmon. Fig. 1.

*Salmo tshawytscha* Walbaum, 1792; Artdi Gen. Pisc., 71: *Salmo orientalis* Pallas, 1831, Zoogr. Ross. Asiat., III, 367; Cuv. Val., 1848; Poiss., XXI, 356: *Salmo quinnat* Rich., 1836, F. Bor. Amer., III, 219; Storer, 1846, Synops., 196; Suckley, Wash. Terr. Nat. Hist., 321; U. S. Fish Com. Rep., pt. 2, 1874, 105; Girard, 1858, Pacif. R. R. Rep., Fish, 306, pl. 67: *Oncorhynchus orientalis* and *O. quinnat* Gunther, 1866, Cat., VI, pp. 158-9: *O. choweecha* Goode, Game Fishes, pt. 10, p. 41, pl.: *O. chowicha* Jord., 1883, Bull. 16, U. S. Mus., 306; Bean, 1883, Bull. 27, U. S. Mus., F, pp. 32, 38; 1884, Rep. Fish. Com., 1043.

B., 16 to 18; D., 14 to 15; A., 18; V., 10; P., 15; pores, 133 to 135; pyloric cæca, 140 to 180; scales, 28 to 30, 138 to 145, 30; adipose fin to lateral line, 15 to 17.

A specimen of twenty-four inches in length is stout, thick and moderately compressed. The head is moderate and subconical, slightly flattened on the sides; its length is less than the depth of the body and is scarcely contained four times in the length of body and head. Eye rather small, nearly three times in the length of the snout or nine times in that of the head. From a vertical on

the front edge of the eye the maxillary curves downward and broadens; it extends farther back than the eye. Vomerine teeth weak, in two series, scattering, or absent. Three or four of the dorsal rays behind the middle of the entire length. Ventral bract nearly equal the length of the fin. Caudal fin lunate, excavation about half the fin's length.

Color silvery, back dark to very dark. Back, flanks and fins generally with scattered small spots of dark.

A specimen of four and a half inches is much more slender. The head is less than one-fourth of the entire length. Snout less than the eye, blunt. Maxillary not reaching behind the eye. Eye four times in the length of the head. Middle of the entire length behind the dorsal. Caudal deeply notched, lobes somewhat convex.

Back brownish, punctulate with brown; flanks silvery. The dorsal tipped with dark. Belly white. Parr-marks about twelve.

The most valuable of the salmons. Said to attain a weight of more than fifty pounds. Introduced in various streams of the Eastern States. Originally occurring in the Pacific, from California to China. Ascending the Columbia and other rivers in enormous numbers.

#### SALMO HISUTCH. *White Salmon.*

*Salmo hisutch* Walb., 1792, Art. Gen. Pisc., 70; *S. kysutch* Bl. Schneid., 1801, 407; *Salmo sanguinolentus* Pallas, 1831, Zoogr. Ross. Asiat., III, 379; *Oncorhynchus sanguinolentus* Gunther, 1866, Cat., VI, 160; *Oncorhynchus lycaodon* Gunther, 1866, Cat., VI, 155, part; *Salmo scouleri* Suckley, 1862, Monogr. Salmo, 94; *Salmo tsuppitch* Rich., 1836, F. Bor. Amer., III, 224; Gunther, 1866, Cat., VI, 118; *Oncorhynchus tsuppitch* Jord., 1880; Forest and Stream, 130; 1883, Bull. 16, U. S. Mus., 307; *S. kisutch* Jord., 1883, Bull. 16, U. S. Mus., 307.

B., 13 to 14; D., 13; A., 16 to 17; pyloric cæca, 45 to 80; scales, 25, 127, 29.

Body moderately stout and compressed. Head short, conical; snout blunt-pointed, longer and wider than lower jaw. Arch between eyes high. Eye quite small. Maxillary long, narrow, reaching behind the eye. Teeth few and small. Vomerine teeth few, those on the tongue feeble. Fins small; pectorals and ventrals short. Ventral bract more than half the length of the fin. Caudal pedicel slender; fin strongly forked.

Sides silvery, with punctulations of dark. Back bluish green. A few small spots on the upper surface, dorsal, and upper part of the caudal. Males reddish in the fall. Reaches a weight of eight

pounds. Abundant from San Francisco northward. Russian name, *Báylooe roóibah*, white fish. From description.

**SALMO NERKA. Red Salmon.**

*Salmo nerka* Walbaum, 1792, Artedl Gen. Pisc., 71; Bl. Schn., 1801, 417; Jord., 1883, Bull. 16, U. S. Mus., 308.

*Oncorhynchus nerka* Jord., 1883, Bull. 16, U. S. Mus., 308 (which see for synonymy).

B., 13 to 14; D., 15; A., 17; V., 10; P., 15; pores, 137; pyloric cæca, 75 to 95; scales, 20, 135 to 143, 20; adipose fin to lateral line, 14.

Body moderately stout. Head subconical, little more than four times in length of body and head. Eye twice in the snout and about eight times in the length of the head. Maxillary broad beneath the eye and extending behind its posterior border. Mouth with a wavy outline. Jaws of the males become elongate, the upper crooked and flexible, in the spawning season. Ventral bract more than half the length of the fin.

Back lustrous blue, olive in alcohol; head from above the eyes dark. Cheeks, sides and belly silvery. Young more or less spotted, and males in the spawning season more or less red. This fish attains a weight of seven or eight pounds. It is considered but little inferior to *S. tshawytscha*. Specimen described twenty inches in length, from Onalaska. Said to occur from the Columbia River to Kamtschatka. Called by the Russians *Krasnoóee roóibah*, red fish.

**SALMO SALAR. Common Salmon. Figs. 2, 3 and 4.**

*Salmo salar* Linné, 1758, Systema, I, 303, — 1766, Syst., 509; Agassiz, 1839, Poiss. d'eau douce, Tab. II; Gunther, 1866, Cat., VI, p. 11; Mitch., 1815, Trans. Lit. and Phil. Soc., I, 435; Rich., 1839, F. B. Am., III, 145; Dek., 1842, N. Y. Fauna, Fishes, p. 24, pl. 38, f. 122; Thompson, 1842, Nat. Hist. Vermont, 140; Storer, 1867, Fish Mass., p. 142, pl. XXV, f. 2; Jord., 1883, Bull. 16, U. S. Mus., p. 312; Bean, 1884, Rep. U. S. Fish Com., 1042; Goode, 1879, Game Fishes U. S., p. 5, pl.

*Salmo gloveri* Girard, 1854, Pr. Phil. Ac., 85; Holmes, 1862, 2d Maine Ann. Rep. Nat. Hist. and Geol., 115.

*Salmo namatus* Holmes, 1862, l. c. 117.

*Salmo sebago* Girard, 1853, Pr. Phil. Ac., 380; Suckley, 1874, Rep. U. S. Fish Com., 143; Gunther, 1866, Cat., VI, 153; Jord., 1880, Man. Vert., 272.

B., 11 to 12; D., 13 to 15; A., 11 to 12; V., 9; P., 14 to 15; pores, 109 to 119; pyloric cæca, 65; scales, 20 to 23, 121 to 136, 20 to 23; adipose fin to lateral line, 14 to 16; vertebræ, 60.

In large specimens of thirty inches or more the body is moderately stout and compressed. Head four and a half times in the length of body and head, subconical. Eye small, three times in the snout, nine in the head. The head of the male is three and a half times in the head and body, without the caudal, and the eye four and a half times in the snout and nine and a half in the head. Last ray of the dorsal near the middle of the entire length. When spread, the caudal margin has but a shallow concavity. Ventral bract not half the length of the fin. Maxillary of the female broader beneath the eye, pointed at the end, reaching a little behind the eye; in the male it is longer and bent downward below the orbit. In adult males the jaws are longer; the upper becomes much produced and turns downward, and the lower has a prominence on the symphysis that frequently turns backward as a hook.

Specimens of twenty inches in length have the snout about two and a half and the head about seven times the length of the eye.

Some are light silvery, with few or no spots on the back and none on the head; others are dark on the back and cheeks, and the flanks are spotted with black; still others, males in which the skin has thickened so as to hide the scales, are nearly black. Parr-marks, ten or eleven; the "parrs" are spotted with black and red. In a large series of specimens I am unable to find one possessed of the X-shaped marks referred to in the descriptions of the European examples.

The species established for the "land-locked salmon" has insufficient foundation. The characters on which it is founded are possessed by the individual, before he visits the sea, and lost during his marine excursion. If we admit that the differences in color, between those that have visited the sea and those that have not, are of specific value, we shall be compelled to place the same individual in different species at different periods of his existence. Figure 2 represents a male of thirty-one and a half inches, figure 3 a female of thirty-eight inches, unspotted, and figure 4 the head of a female with the spots on head and shoulders.

#### SALMO IRIDEUS. *Rainbow Trout.* Fig. 5.

*Salmo iridea* Gibbons, 1855, Pr. Cal. Acad., I, 36, 37: *Salmo irideus* Gunther, 1866, Cat., VI, 119; Suckley, 1874, Rep. U. S. Fish Com., pt. 2, 129; Jord., 1883, Bull. 16, U. S. Mus., 312; Bean, 1884, Rep. U. S. Fish Com., 1042: *Salar iridea* Girard, 1856, Pr. Phil. Ac., 220, — 1858, Pacif. R. R. Rep., Fish, p. 321, pl. 73, f. 5, and pl. 74.

B., 11; D., 14; A., 13 to 14; V., 10; P., 15; pores, 125; scales, 26, 140 to 155, 26; second dorsal to lateral line, 18.

Body moderately short and compressed. Head four and a half

times in the entire length; arch from eye to eye medium. Eye less than four and a half times in the length of the head, once in length of snout, and one and a half times in the interorbital space. Snout as long as the eye, blunt. Maxillary not reaching behind the eye; longer in large males. Two rays of the dorsal behind the middle of the entire length. Pectorals, in specimen figured, reaching a little more than half-way from their bases to those of the ventrals. Ventral bract not half the length of the fin. Caudal with a shallow notch. A row of about seven teeth on each side of the shaft of the vomer.

Back brown, with a bluish tint, closely set with spots of brown. Sides and belly dark with closely-placed punctulations of brown, with numerous spots of brown on the flanks. Larger spots of brown on head and cheeks. On the flank a series of eight parr-marks is included in a brick-red longitudinal band. Dorsal and caudal with many spots of brown. Caudal with a lighter band along its posterior border. The specimen figured is very dark; the species varies to very light and silvery. Specimen eight inches long, from a lot introduced in New England by the Fish Commissioners. In eighteen specimens from Carissima Creek, Cal., I find none so dark as the above. The disposition of spots is similar, but in cases, those below the parr-marks are larger. Streams west of the Sierras, from southern California to Oregon. Introduced in the Eastern States. Five to six pounds.

*SALMO GAIRDNERI. Gairdner's Salmon. Fig. 6.*

*Salmo gairdneri* Richardson, 1836, F. Bor. Amer., III, 221; Suckley, Monogr. Salmo, 114; Gunther, 1866, Cat., VI, 118; Jord., 1883, Bull. 16, U. S. Mus., 313: *Salmo purpuratus* Gunther, 1866, Cat., VI, 116: *Salmo truncatus* Suckley, 1862, Monogr. Salmo, 3; Gunther, 1866, Cat., VI, 118.

B., 12 to 13; D., 14 to 15; A., 13 to 14; V., 10; P., 15; pores, 123 to 129; scales, 25 to 27, 140 to 157, 25 to 28; adipose fin to lateral line, 17; pyloric cæca, 42; vertebrae, 58.

Description from a twenty-inch specimen from the Sacramento River. Body moderately stout, nearly as much so as that of *S. salar* of the same size. Head rather short, four and a half to five times in the entire length, compressed; crown well arched from eye to eye. Snout pointed, from two to two and a half times the eye. Maxillary curved downward below and reaching behind the orbit; longer and more slender in males. Vomerine teeth in two series. Caudal notch very shallow, obliterated on spreading the fin. Ventral bract long, not half the length of the fin. Adipose fin rather large. In the female the caudal notch is regular; in large males it appears as in Fig. 6.

Scales silvery. Back brownish (bluish in life), and, with upper part of flanks, the dorsals and caudal, thickly sprinkled with spots of brown. Belly yellowish or reddish. In the example figured, a male of seventeen inches, the lower jaw is turned upward with a knob on the symphysis. The species reaches a weight of twenty pounds. It is found about the mouths of the rivers from the Sacramento northward. It has harder, stronger bones than *S. tshawytscha*, and spawns later.

**SALMO CLARKII.** *Clark's Trout.* Fig. 7.

*Salmo clarkii* Rich., 1836, F. B. A., III, 225; Jord., 1878, Pr. U. S. Mus. I, 77.

*Fario stellatus* Girard, 1856, Pr. Phil. Ac., 219.

*Salmo brevicauda* Suckley, 1861, Ann. N. Y. Lyc., VII, 308; Gunther, 1866, Cat., VI, 120.

*Salmo stellatus* and *S. gibbsi* Gunther, 1866, l. c. 117, 119.

*Salmo tsuppich* Jord., 1878, Pr. U. S. Mus., I, 72.

*Fario aurora* Girard, 1856, Pr. Phil. Ac., 219.

*Salmo purpuratus* Jord., 1883, Bull. 16, U. S. Mus., 315.

B., 11 to 12; D., 14 to 15; A., 14 to 15; V., 10; P., 15; pores, 129; pyloric cæca, 43; scales, 25, 151, 25; adipose fin to lateral line, 15.

Moderately stout and compressed. The head and body are four times the length of the head. Mouth large. Maxillary bent downward below and reaching behind the eye in the male; a little shorter and straighter in the female. Eye small; less than three times in the snout and seven and a half in the head. Snout long, lower jaw slightly hooked upward. Vomerine teeth in irregular series. Interorbital space high arched; width about three times that of the eye. The middle of the dorsal is in the middle of the entire length. Pectorals not reaching half-way from their bases to those of the ventral. Ventral bracts slender, elongate. Caudal notch very shallow.

Back, top of head, dorsals, and tail light brownish, spotted, more or less profusely, with small spots of brown. Flanks silvery, belly light yellowish. Varies in color from very dark, very spotted, to very light, silvery, with spots obsolete. Flesh white.

In a female from Lake Bigler, Cal., the head is less than a fourth of head and body, and the eye is twice in the length of the snout. A line through the middle of the entire length cuts off the posterior third of the base of the dorsal. Caudal notch shallow, regular. Colors as in preceding. Said to reach a weight of twenty pounds. Species found from California northward, with its varie-

ties ranging from California, New Mexico and Colorado northward. Specimen described seventeen inches in length; Fig. 7.

**SALMO VIRGINALIS. Utah Trout. Fig. 8.**

*Salar virginalis* Girard, 1856, Pr. Phil. Ac., 220, — 1858, P. R. R. Rep., X, p. 320, pl. 73, f. 1-4.

*Salmo virginalis* Gunther, 1866, Cat., VI, p. 123.

*Salmo spilurus* Cope, 1871, Hayden's Rep., 470; Jordan, 1878, Pr. U. S. Mus., I, p. 74, — 1883, Bull. 16, U. S. Mus., 314.

*Salmo pleuriticus* Cope, 1871, Hayden's Rep., 471; Jordan, 1878, Pr. U. S. Mus., I, 74; Cope, 1874, Pr. Am. Phil. Soc., 132, — Surv. W. 100th Merid., V, 693.

*Salmo spilurus* var. *pleuriticus* Jord., 1883, Bull. 16, U. S. Mus., 314.

*Salmo spilurus* Subsp. *pleuriticus* Jord., 1878, Pr. U. S. Mus., I, 74.

B., 11 (10 to 12); D., 14 (14 to 15); A., 14 (14 to 15); V., 9; P., 15; pores, 126; scales, 36 to 38, 180 to 188, 38 to 42; adipose to lateral line, 25 to 27.

A variety of *S. clarkii*. Specimen described twelve and a half inches in length. Moderately stout and compressed, similar to *S. fontinalis*, perhaps a little more slender. Head well arched from eye to eye, four and a half times in the length of body and head. Snout blunt-pointed, near one and a half times the eye. Jaws about equal. Two series of vomerine teeth. Maxillary bent downward beneath the eye, extending behind the eye near half the diameter of the latter. Three rays of the dorsal behind the middle of the entire length. Caudal notch shallow, and pedicel rather deep.

Upper surface and tail brownish, flanks silvery. More or less thickly sprinkled with small brown spots, most numerous toward the tail, distinct on back and head, becoming smaller or obsolete toward the belly. Common in Colorado, Utah and New Mexico, reaching a weight of six pounds; flesh very fine, especially so in the mountain streams.

**SALMO LEWISI. Lewis's Trout. Fig. 9.**

*Salar lewisi* Girard, 1856, Pr. Phil. Ac., 210, — 1858, Pacif. R. R. Rep., Fish, 318, pl. 72: *Salmo lewisii* Gunther, 1866, Cat., VI, 122: *Salmo purpuratus* var. *bouvieri* (Bend.) Jord., 1883, Bull. 16, U. S. Mus., 315, and var. *stomias* p. 316: *Salmo stomias* Cope, 1870, Hayden's Rep., 433; Jord., 1878, Hayd. Rep., 316.

B., 10; D., 13 (13 to 14); A., 13 (13 to 14); V., 9; P., 14 to 15; pores, 127 to 133; scales, 37 to 38, 197 to 210, 38 to 42; adipose to lateral line, 23.

A specimen of eight and a half inches has the shape and proportions of *S. clarkii*, of which it is a variety. The caudal notch



is slightly deeper. The spots are more numerous, especially toward the tail; apparently they are of two kinds on this specimen: small, very black ones on the outside, profusely scattered over back, flanks and fins, and larger ones that seem to lie beneath the scales in the skin, forming irregular series along the sides. Head waters of the Missouri from Colorado northward; in the mountains of Dakota and Montana.

*SALMO HENSHAWI. Henshaw's Trout.*

*Salmo henshawi* Jordan, 1878, Man. Vert., 358, — 1878, Pr. U. S. Mus., I, 75: *S. henshawi* and *S. tsuppitch* Jord., 1878, Chief Eng. Rep. App. NN. pp. 196, 197, fig.

B., 11; D., 12; A., 14; V., 9; P., 14; pores, 127; pyloric cæca, 50 to 60; scales, 36, 160, 38; adipose fin to lateral line, 23.

Specimen described a female thirteen and a half inches long, from Donner Lake, Cal. Moderately slender and compressed. Head little less than four and a half times in the length of body and head; snout short, blunt, rounded, length about one and a half times that of the eye. Eye rather large, six times in the length of the head. Maxillary long, nearly straight, extending behind the eye. One or two rays of the dorsal behind the middle of the entire length. Caudal notch shallow, posterior margin slightly concave when the fin is spread.

Upper part of flank light reddish brown, back darker, belly lighter. Back, sides, head and fins with scattered spots of brown, the larger about an eighth of an inch in diameter, growing smaller toward the belly. Attains a weight of ten pounds or more. An excellent trout, common in the Truckee River, and the lakes, Tahoe, Donner and others, from which it receives its waters.

*SALMO LEVENENSIS. Loch Leven Trout.*

*Salmo levenensis* Walker, 1811, Wern. Mem., I, 541; Yarrell, 1839, Brit. Fish, ed. 1, suppl., p. 9, — ed. 2, II, 117, — ed. 3, I, 257; Gunther, 1866, Cat., VI, 101.

*Loch Leven Trout* Richardson, 1836, Fauna Bor. Amer., Pisc., 143.

D., 13; A., 11; P., 14; V., 9; lateral line, 118; transverse line,  $2\frac{3}{8}$ ; pyloric cæca, 60 to 80; vertebræ, 59.

Head rather small. Body elongate. Snout of moderate length, conical, not much produced in the male, in which a mandibular hook has not been noted. Maxillary, narrow, feeble, reaching as far back as the eye in large specimens, or little farther. Teeth moderate. A series of two or three teeth across the base of the vomer. On the body of the vomer the teeth are in a single series. Caudal emarginate, when stretched to the utmost appearing truncate. Middle

rays of tail half as long as outer ones in older specimens. Hind part of body rather slender.

Brownish or greenish olive above; sides of the head with round black spots; sides of the body with more or less numerous X-shaped or rounded brown spots. Dorsal and adipose fins with numerous small brown spots; end of pectoral light blackish; dorsal and anal without black or yellow margin. Reaches a weight of upwards of four pounds.

Found in Loch Leven and other lakes in southern Scotland and northern England. One of the most recent introductions in the United States. Not migratory. From description.

#### SALMO FARIO. *River Trout.*

*Salmo fario* Turton, Brit. Faun., 103; Donovan, Brit. Fish, IV, pl. 85; Flem., Brit. An., 181; Rich., F. Bor. Amer., 144, pl. 92; Jenyns, Man. Vert., 424; Yarrell, Brit. Fish, ed. 2, II, 85,—ed. 3, I, 261; Day, Fish Brit. and Ireland, V, 95, pl. CIX, f. 3, CXIII, CXIV, CXVI, f. 1; Bean, 1884, Rep. Fish Com., 1043.

*Salmo fario aussonii* Gunther, 1866, Cat., VI, 64.

D., 13 to 14; A., 10 to 11; V., 9; P., 13; pyloric cæca, 38 to 50; scales, 26, 120, 30; vertebræ, 56 to 58; adipose fin to lateral line, 16 rows.

Body rather stout. Head medium. Snout somewhat produced in males, lower jaw hooked in very old ones. Maxillary strong, dilated, extending as far back as the eye in young specimens, and farther in those of ten inches or more; longer in males. Teeth strong. Vomer with a transverse series of teeth at its base and a double series along its body. Fins moderate, rounded. Caudal fin with a shallow notch in the young, becoming truncate early in life.

Flanks, head, back, and dorsal with spots of red and of black. Usually the first rays of dorsal, anal and ventrals are yellowish.

Found in the fresh waters of Central and Northern Europe and England, whence it has been introduced in the United States. Reaches a length of thirty inches, the female, according to Dr. Gunther, becoming mature when not more than eight.

#### SALMO SALVELINUS. *Saelbling.*

*Salmo salvelinus* Linné, 1758, Syst., 309,—1766, Syst., 511; Bloch, Fische Deutschl., taf. 99; Meidinger, Ic. Pisc. Austr. tab. 22; Cuv. Val., 1848, Hist. Poiss., XXI, 246; Heckel, 1851, Sitzb. Ak. Wien, p. 89; Heck. and Kner., 1858, Susswasserf., 280; Siebold, 1863, Fische Europe, 280, part.; Gunther, 1862, Pr. Zool. Soc. Lond., 38,—1866, Cat., VI, 126; Bean, 1884, Rep. Fish Com., p. 1042.

*Salmo umbla* Agassiz, 1839, Poiss. d'eau douce, pl. 9.

D., 12 to 14; A., 13; V., 9; P., 13 to 14; pyloric cæca, 36; vertebræ, 64; scales, 29, 204 to 220, 28.

Elongate and somewhat compressed. Head about four and a half times in the entire length. Maxillary broadening behind its middle, reaching as far back as the eye in small specimens, becoming longer with age. In a twelve-inch trout the eye is nearly five times in the length of the head, twice in the interorbital space, and less than twice in the length of the snout. Teeth rather weak. Vomerine teeth few, on the head of the bone. Fins medium. Ventral bract not half the length of the fin. Caudal notch deeper than that of *S. fontinalis*, not half the depth of the fin. Caudal pedicel slender.

Back olivaceous, or brownish; flanks silvery; belly yellowish. The silvery color of the lower cheek is rather sharply limited by the darker color extending from the top of the head as far down as the eye. In the specimens before me the dark color of the back extends down the flank to the lateral line. In the figure given by Prof. Agassiz, it includes the entire flank. Sides sprinkled with spots of light color. Young with the parr-marks have a few small red spots in addition to these. Lower surface, orange in the spawning season; lower fins with white anterior margins. Alpine lakes of Bavaria and Austria. Recently introduced in the United States.

*Salmo namaycush* Pennant, 1792, Introd. Arct. Zool., p. 298, — Arct. Zool., II, Suppl., 139. *Salmo namaycush* Walb., 1792, Art. Gen. Pisc., 68; Rich., 1836, F. Bor. Amer., III, 179, pl. 75, pl. 85, f. 1; Kirtl., 1842, Bost. Jour. N. H., IV, p. 25, pl. 3, f. 2; Agass., 1850, Lake Superior, 331; Gunther, 1866, Cat., VI, 123; Donnd., 1798, Zool. Beytr., III, 647.

*Salmo amethystinus* Mitch., 1818, Jour. Ac. Sci. Phil., 410; Dek., 1842, New York Fish, 240, pl. 76, f. 241; Storer, 1846, Synops., 193.

*Salmo toma* Hamlin, Brochure on the Togue; Holmes, 1862, 2d Ann. Rep., Maine, 109.

*Salmo confinis* Dek., 1842, N. Y. Fish, 238.

*Salmo symmetrica* Prescott, 1851, Am. Jour. Sci., XI.

*Cristivomer namaycush* Jord., 1880, Man. Vert., 359; Goode, 1879, Game Fishes, p. 33, pl.

*Salvelinus namaycush* Jord., 1883, Bull. 16, U. S. Mus., 317; Bean, 1884, Fish Com. Rep., 1042.

B., 11 to 12; D., 14; A., 13, to 14; V., 10; P., 14 to 15; pores, 117 to 136; scales, 28 to 30, 185 to 210, 26 to 32; adipose fin to lateral line, 23.

Rather stout, moderately compressed. Head large, about one-fourth of the entire length; crown flattened; snout broad, rounded; jaws about equal. Maxillary strong, extending behind the eye,

longer in old examples. Teeth strong, in a single series on the vomer. Eye large; in a fourteen-inch specimen it is half the length of the snout, one-sixth that of the head, and half the width of the interorbital space. Opercles smooth. Fins medium; caudal notch deep, more than half the fin. Ventral bract short. Adipose fin of moderate size. Head longer and jaws more crooked in old males. Fig. 10 twenty-four, and Fig. 11 fourteen inches.

Grayish brown, very light to very dark, with pale spots on the sides, and dark marblings on the cheeks. Belly silvery. Dorsal and caudal spotted with light. Large specimens from the Lac des Neiges, Canada, are almost black (probably a good variety), others from New York are light grayish. Flesh reddish. One of the largest of the *Salmonidæ*. A thirty-one inch specimen weighed near fifteen pounds. The great lakes and their tributaries, eastward to the Atlantic, northward to Hudson's Bay. Generally not so fat as the variety *Siscowet*, of Lake Superior.

**SALMO SISCOWET.** *Siscowet*. Fig. 12.

*Salmo siscowet* Agassiz, 1850, Lake Superior, p. 333, pl. I, fig. 3; Gunther, 1866, Cat., VI, 124; Jordan, 1876, Man. Vert., 261: *Salmo namaycush* var. *siscowet*, Jordan, 1883, Bull. 16, U. S. Mus., 318.

B., 11 to 12; D., 14; A., 14; V., 9; P., 14; pores, 124; scales, 30, 200 to 207, 30; from adipose to lateral line, 23.

Moderately stout, short and deep. Head very little more than three and a half times in the length; without caudal; nearly flat; slightly convex between the eyes. Snout broad, rounded; its length equals the width of the interorbital space. Median keel of skull low. Eye about twice in length of snout, and six and a half times in that of the head. A median series of teeth on the vomer anteriorly. Maxillary of moderate width, elongate, reaching some distance behind the eye. When dried the opercles are seen to be striate, with grooves radiating from the bases of the bones. Scales small, with concentric striæ. Caudal deeply notched, nearly half the depth of the fin. The middle of the dorsal is about the middle of the entire length. Three of the posterior rays of the dorsal stand over the ventral. Usually very fat. Originally found in Lake Superior; introduced in various waters by the Fish Commissioners. Specimen figured nineteen and a half inches in length.

**SALMO OQUASSA.** *Blue Back*. Fig. 13.

*Salmo oquassa* Girard, 1854, Pr. Phil. Ac., 262; Holmes, 1862, 2d Ann. Rep. Nat. Hist. and Geol., Maine, 113; Gunther, 1866, Cat., IV, 154; Jord., 1876, Man. Vert., 260, and 1880, 272: *Salvelinus oquassa* Jord., 1880, Man. Vert., 360, — 1883, Bull. 16, U. S. Mus., 318.

B., 10; D., 12 to 13; A., 12; V., 9; P., 12; pores, 138 to 140; pyloric cæca, 32; scales, 30 to 34, 202 to 214, 30 to 36; adipose fin to lateral line, 23.

Species small, slender. Specimen described about nine and a half inches in length. Head rather small, about four and three-fourths times in the length of body and head: arch of the crown between the eyes very low, the space being nearly twice the diameter of the eye. Snout elongate, pointed, lower jaw little the longer. Eye one and a half times in the length of the snout, twice in the interorbital space, and near six times in the length of the head. Maxillary not reaching a vertical from the posterior border of the eye. Last ray of dorsal in the middle of the entire length. Ventrals short, bract not half the length of the fin. Caudal peduncle slender; notch deep, not half the fin; posterior margin sinuous. Adipose fin elongate, narrow.

Back blue in life, olivaceous in alcohol. The sides have a rich reddish tint in the dark color. Scales of lower part of sides and of the belly silvery. Eleven parr-marks on the side. In the larger specimens these marks are not distinctly defined, though quite visible. Sides thickly sprinkled with small pale spots, red in life, which become smaller above the lateral line.

Found only in Maine, in the Rangeley lakes, their tributaries and outlets; Androscoggin River.

SALMO NARESII. *Nares's Trout.*

Gunther, 1877, Pr. Zool. Soc. Lond., 476; Jord., 1884, Bull. 16, U. S. Mus., 318.

B., 11; D., 13; A., 11; pyloric cæca, 28 to 42; vertebrae, 63 to 65.

Body much elongate. Head one-fourth to two-ninths of the total, without caudal. Snout obtuse; forehead flat. Maxillary reaching hind margin of eye in males; shorter in females. Teeth very small; vomerine on front end of vomer; a band of villiform teeth along the middle of the hyoid bone. The gill-cover shows scarcely a trace of the radiating and concentric striae by which *S. nitidus* is characterized. Scales minute.

Light greenish olive above; sides silvery, with very small red spots; deep reddish pink below. Dorsal and upper part of caudal dark; lower fins deep red, with yellowish white margins. Lakes of the Arctic regions, in the neighborhood of Discovery Bay and Cumberland Gulf, in depths of ten to fifteen fathoms. Largest example ten inches; others, male and female, only eight, with sexual organs fully developed, and the ova ready for extrusion. From description.

## SALMO ARCTURUS.

Gunther, 1877, Pr. Zool. Soc. Lond., 294, pl. XXXII; Jord., 1884, Bull. 16, U. S. Mus., 319.

B., 11; D., 13; A., 12; pyloric cæca, 31 to 42.

Body rather elongate. Head small, scarcely one-fifth of the total length, without caudal. Snout very obtuse. Maxillary reaches about to the hind margin of the orbit in males; shorter in females. Teeth small; vomerine limited to front end of vomer; a band of villiform teeth along the middle of the hyoid bone. Caudal moderately excised. Scales minute.

Dull brownish green above; silvery or reddish below. Dorsal and caudal dark; lower fins yellowish. No dots or ocelli. Young with numerous parr-marks.

Specimens twelve inches long are full-grown. Victoria Lake, N. Lat., 82° 34'; Floeberg Beach, N. Lat., 82° 28'. From description.

## SALMO MALMA.

*Salmo malma* Walbaum, 1792, Artedi, Gen. Pisc., 66; Jord., 1883, Bull. 16, U. S. Mus., 319 (which see for synonymy).

B., 11; D., 14; A., 11 (12); pyloric cæca, 45 to 50; scales, 39, 240, 36.

Stouter than *S. fontinalis*, sub-round. Head long, less than four times in the length, without caudal. Snout rather pointed, more than twice the length of the eye, broad. Adipose fin large; other fins short. Caudal with a very shallow notch. Opercles smooth.

Olivaceous; sides with round spots of red, smaller spots of light color on the back. Lower fins with a narrow light stripe, followed by one of dark color. Spots faint or obsolete to very distinct. Color varying from light to very dark. Said to reach a weight of twelve pounds. Kamtschatka to the Northwestern United States. Visiting the seas.

SALMO FONTINALIS. *Brook Trout*. Figs. 14, 15, 16.

*Salmo fontinalis* Mitchell, 1815, Trans. Lit. and Phil. Soc. N. Y., 485; Rich., 1836, F. B. Amer., p. 176, pl. 83, f. 1; Dek., 1842, Fish N. Y., 235, pl. 38, f. 120; Gunther, 1866, Cat., VI, p. 152: *Salvelinus fontinalis* Jord., 1878, Pr. U. S. Mus., 82; Goode, 1879, Game Fishes, pt. 1, p. 7, col. plate; Jord., 1883, Bull. 16, U. S. Mus., 320; Bean, 1883, Bull. 27, U. S. Mus., 41, — 1884, Rep. U. S. Fish Com., 1041: *Baione fontinalis* Dek., 1842, Fish N. Y., 244, fig. 53, — *Salmo erythrogaster* Dek., l. c. 236, fig. 126: *Salmo canadensis* Smith, 1834, Griff. Cuvier, X, 474: *S. immacu-*

*latus* Storer, 1850, Bost. Jour. N. H., 364; Gunther, 1866, Cat., VI, 125  
*S. hudsonicus* Suckley, 1861, Ann. N. Y. Lyc., 310; Gunther, l. c. VI, 153.  
Jord., 1878, Pr. U. S. Mus., I, 81.

B., 10 to 11; D., 13 to 14; A., 11 to 12; V., 8; P., 13 to 14;  
scales, 40 to 44, 200 to 240, 40 to 46; second dorsal to lateral  
line, 28; pores, 107 to 118.

Body moderate, slightly compressed, stout in large specimens.  
Head medium, low arched between orbits, blunt-pointed at snout.  
In a ten-inch female the head is four and a half, and in a ten-inch  
male it is three and a half times in the total length, without caudal.  
The diameter of the eye of the female figured is less than one and  
a half times in the length of the snout, while that of the male is  
more than twice. In the former this diameter is contained five  
and a half times, and in the latter six and a half times in the length  
of the head. Of a twenty-one inch female the head was less than  
the depth of the body, and but four and a half times in the entire  
length; the eye was one and a half times in the length of the snout  
and seven in that of the head. Maxillary reaching behind the eye,  
longer and more curved in adult males. Last ray of dorsal about  
the middle of the entire length. Pectorals reaching near half way  
from their bases to those of the ventrals. Ventral bract rather  
small.

In young ones the caudal notch is shallow. Spreading the fin  
to its utmost nearly or quite obliterates the notch in larger speci-  
mens. In that figured, fig. 16, and others from the same region,  
the upper half of the caudal is convex in its lower portion, which  
gives the margin a sinuous outline.

Back, and top of head, brownish, more or less vermiculate and  
spotted with darker. Dorsal and tail irregularly banded or spotted  
with brown. Sides sprinkled with round pale spots, red in life. A  
bridle or crescent (of brown) from one nostril to the other, convex  
forward. In the breeding season the outer border of the lower fins  
is whitish, and parallel with this, near the edge, is a dark line; the  
males have chin, throat and lower edge of each flank more or less  
marked with dark color, and their lower surface becomes brilliant  
reddish, or orange and cream color. Reaches a weight of eight  
pounds. A fine one, sent in by Commissioner Hayes, was twenty-  
one inches in length and of about four pounds weight.

Found in the Great Lakes, their tributaries, the region eastward  
to the Atlantic and southward to Alabama.

Figure 14 represents a ten-inch male, figure 15 a female of about  
eleven inches, and figure 16 a female of twenty-one. The latter  
differs in various respects from the others, as in the nearly uniform  
brownish of the back, shape of caudal, etc. A knowledge of

the younger stages from the same locality may lead to the separation of this form. Its shape resembles that of the salmon.

**SALMO AGASSIZII.** Figs. 17, 18.

B., 11 to 13; D., 12 to 13; A., 10 to 12; V., 8 to 9; P., 14 to 15; pores, 109 to 119; scales, 38 to 42, 217 to 237, 38 to 42; second dorsal to lateral line, 28.

A variety of the brook trout; apparently restricted to the small lakes in the neighborhood of Dublin, New Hampshire. Compared with those of *S. fontinalis*, the young are rather more slender, the caudal notch slightly deeper, and the sides more silvery. The young are much darker colored than the adults; on both the red spots of the flanks are large and numerous. On the adult figured, fig. 18, the brown color has become so much bleached that the specimen is nearly uniform silvery; very faint indications of the red spots remain. The differences between the young of *S. fontinalis* and those of this variety are even more marked than those between adults; side by side, the clouded parr-marks or bands at once distinguish the young of *S. agassizii*. Apparently it is later in attaining sexual development, and has the appearance of a deep water species. Fig. 17, seven and a half inches.

Snout longer than eye; maxillary extending behind orbit; in young (fig. 17) the diameter of the eye equals the length of the snout, and the length of the head is one-fourth of the total, without caudal; the length of the head of a twelve and a half inch specimen (fig. 18) equals the depth of the body, and is contained four and three-fourths times in the length of the body and head.

Dublin Pond; Lake Monadnock, Keene, N. H.; Center Pond.

**SALMO HOODII.** *Hood's Trout.*

*Salmo hoodii* Rich., 1836, Fauna Bor. Amer., III, 173, pl. 83, f. 2, pl. 87, f. 1, — Ross's Voy., Nat. Hist. App., p. 58; Gunther, 1866, Cat., VI, 150: *Salvelinus hoodii* Jord., 1883, Bull. 16, U. S. Mus., 321.

B., 10 to 11; D., 12; A., 11; V., 8 to 10; P., 13 to 15; scales, 28, 268; lateral line, 126.

Elongate. Head little more than a sixth of the entire length. Maxillary reaching behind eye. The species is somewhat closely allied to *S. fontinalis* in general appearance.

"Back and sides intermediate between olive-green and clove-brown, bestudded with yellowish-grey spots as big as a pea; a few of these spots on the gill covers. . . . Dorsal and upper lobe of the caudal marked with smaller spots." Specimen described twenty-one inches long. Flesh red.

Mingan River to Boothia Felix. From description.



SALMO ROSSII. *Ross's Trout.*

*Salmo rossi* Richardson, 1836, Fauna Bor. Amer., III, 163, pl. 80, — Ross's Voy., Nat. Hist. App., p. 56; Suckley, Monogr. Salmo, 120; Jord., 1883, Bull. 16, U. S. Mus., 321.

B., 12 to 13; D., 13; A., 11; V., 10; P., 14; scales, 30, 240; lateral line, 134.

Slender. Snout obtuse; lower jaw very long, terminating in an incurved knob (in males). Head one-fifth of the length of body and head. Pores on head and face very conspicuous.

"The back, top of head, dorsal and caudal fins, have a hue intermediate between oil-green and hair-brown; the cheeks are nacreous, and the sides pearl-gray, with a blush of lilac and a silvery lustre; there are a number of scattered dots of carmine in the vicinity of the lateral line; the color of the belly varies in different individuals from faded orange to tile-red and arterial blood-red."

Sir John Richardson says of this species:—" *Salmo Rossii* is so extremely abundant in the sea, near the mouths of the rivers of Boothia Felix, at certain seasons, that three thousand three hundred and seventy-eight individuals were obtained at one haul of a small-sized seine. They varied in weight from two to fourteen pounds, and rather exceeded, in the aggregate, six tons. In some the color of the flesh was of a dark red, in others it was very pale, the dark ones being the firmest and best flavored." Later writers have not recognized the species.

## SALMO NITIDUS.

*Salmo nitidus* Richardson, 1836, Fauna Bor. Amer., III, p. 171, pl. 82, f. 1, pl. 86, f. 2, — Nat. Hist. App., Ross's Voy., p. 57; Gunther, 1866, Cat., VI, 150.

*Salvelinus nitidus* Jord., 1883, Bull. 16, U. S. Mus., 321.

B., 11 to 12; D., 14; A., 12; V., 10; P., 17; scales, 36, 270 (215 Gunther), 42; lateral line, 120.

Elongate. Head moderate, one-fifth or a little more of the entire length. Snout about twice the length of the eye. Maxillary straight, strong, extending as far back as the eye, farther in males. Teeth medium. Teeth not only on the head of the vomer, but also two or three behind it. Caudal fin conspicuously emarginate, the middle rays being about half as long as the longest. The orbit is one and a half times its length from the tip of the snout, or six times in the head. Opercles with radiating and concentric striae.

"Body above the lateral line deep green, softening towards the belly, which is of a beautiful yellowish-red tint posterior to the pectoral fins; throat and region of the pectorals white, slightly clouded

by yellowish-red. There are several rows of ocellate red spots, confined principally to the space between the lateral line and yellowish-red of the belly; they vary in size, the largest being as big as a pea. Dorsal fin colored like the back. Under fins dusky-red, the anal paler, and the first rays of the pectorals, ventrals and anal white." Lakes in Boothia. The specimens described were twenty-one inches in length. From description.

*SALMO ALIPES. Long Finned Trout.*

Richardson, 1836, Fauna Boreali Amer., III, p. 169, pl. 81, pl. 86, f. 1, and Nat. Hist. App., Ross's Voy., p. LVII; Gunther, 1866, Cat., VI, 149, and 1877, Pr. Zool. Soc., 476: *S. stagnalis* Jordan, 1883, Bull. 16, U. S. Mus., p. 321.

B., 11 to 12; D., 12 to 13; A., 11; lateral line, 210; pyloric cæca, 41.

Elongate. Head moderate; snout elongate, pointed; lower jaw extending beyond upper in adults. Teeth small. Maxillary narrow, reaching behind eye. Operculum and sub-operculum very conspicuously and densely striated, the striæ radiating from the base of each of the bones. Fins much developed. Pectoral reaching more than half the distance from its root to that of the ventral, which also is long. Adipose small. Caudal conspicuously emarginate, even in old examples.

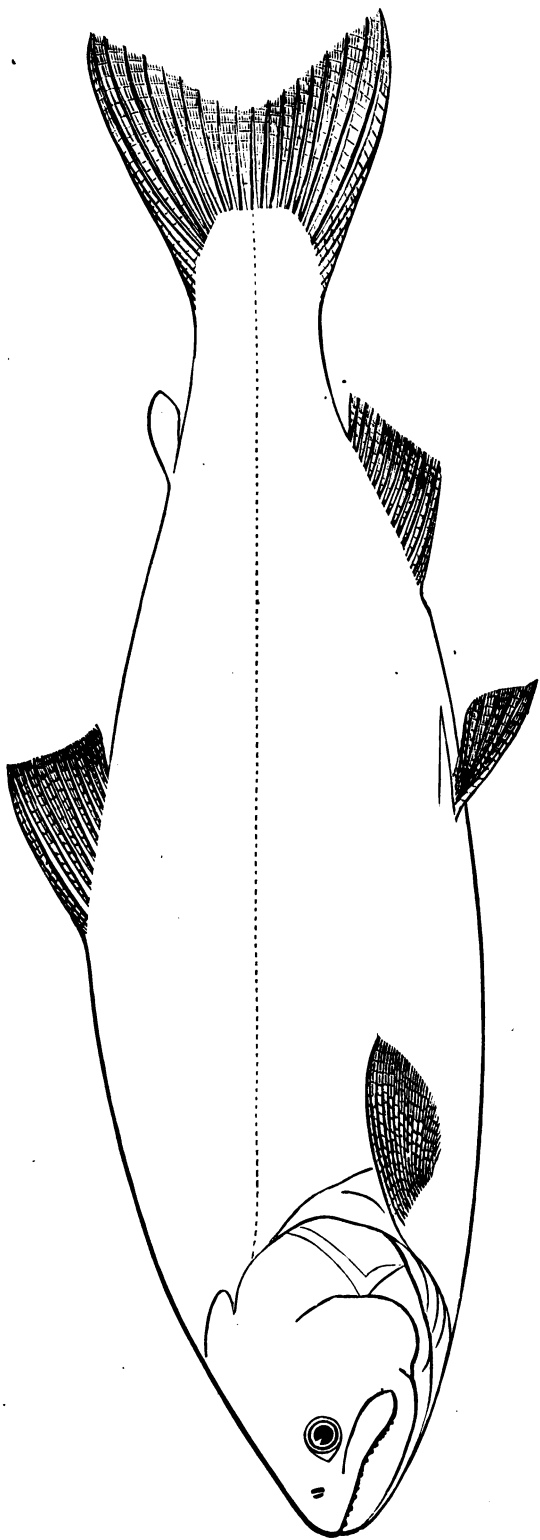
"Of this species two examples were obtained, about fifteen inches long; it is a well-marked species of Charr, characterized by the deep radiating and concentric striation of the gill covers. The typical specimens were obtained in Boothia Felix, so that this Charr has an unusually wide range. Color silvery, with scarcely any pinkish tinge." From description.

*SALMO STAGNALIS. Fig. 19.*

*Salmo stagnalis* Fabricius, 1780, Fauna Grœnlandica, 175.

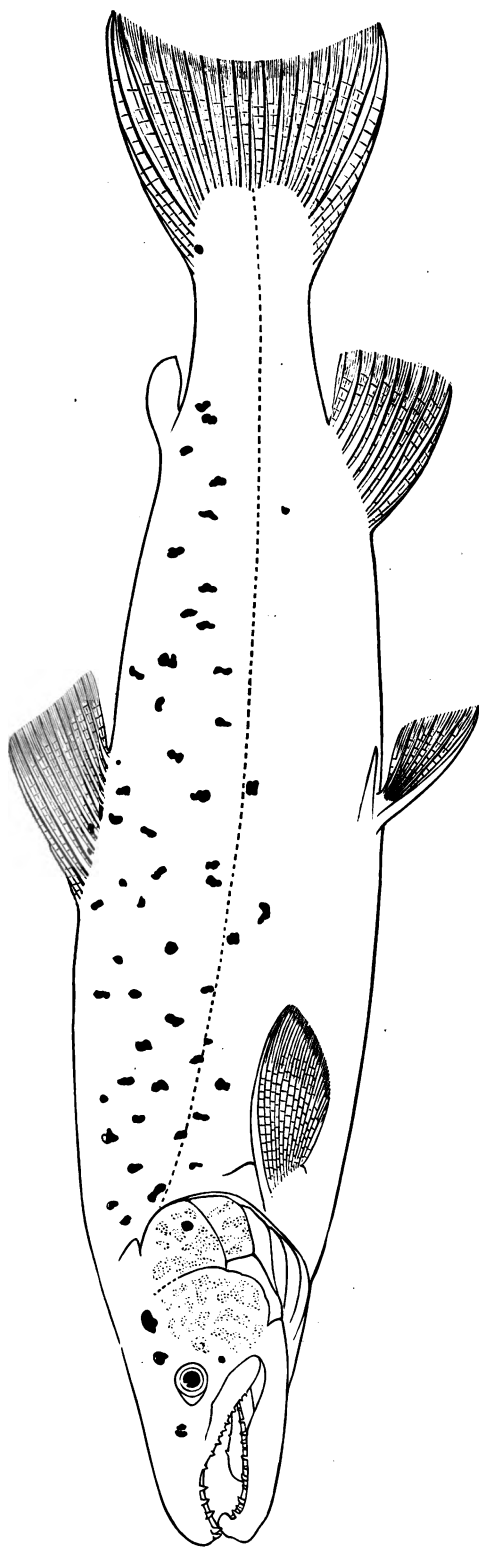
B., 10 to 11; D., 13 to 14; A., 12 to 13; V., 9; P., 14; pyloric cæca, 48; scales, 30, 200 to 204, 30; adipose fin to lateral line, 25 to 27; pores in lateral line, 130.

Slender, elongate. Head scarcely one-fifth of the total length, without caudal; crown between orbits high, skull with a considerable crest. Eye small, less than half the length of the snout. Jaws equal. Maxillary extending very little behind the eye in the male; shorter in the female. Pre-opercle rounded; the lobe shown in the specimen drawn does not appear in the female. Bones of



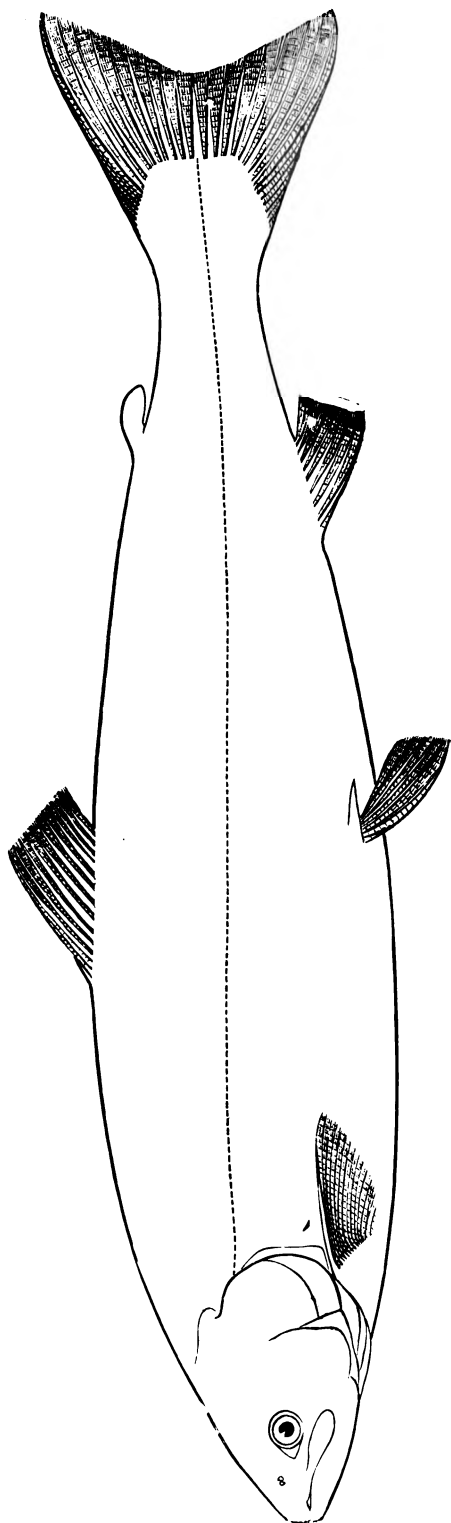
1. *Salmo trutta*. Female.





2. *Salmo salar*. Male.

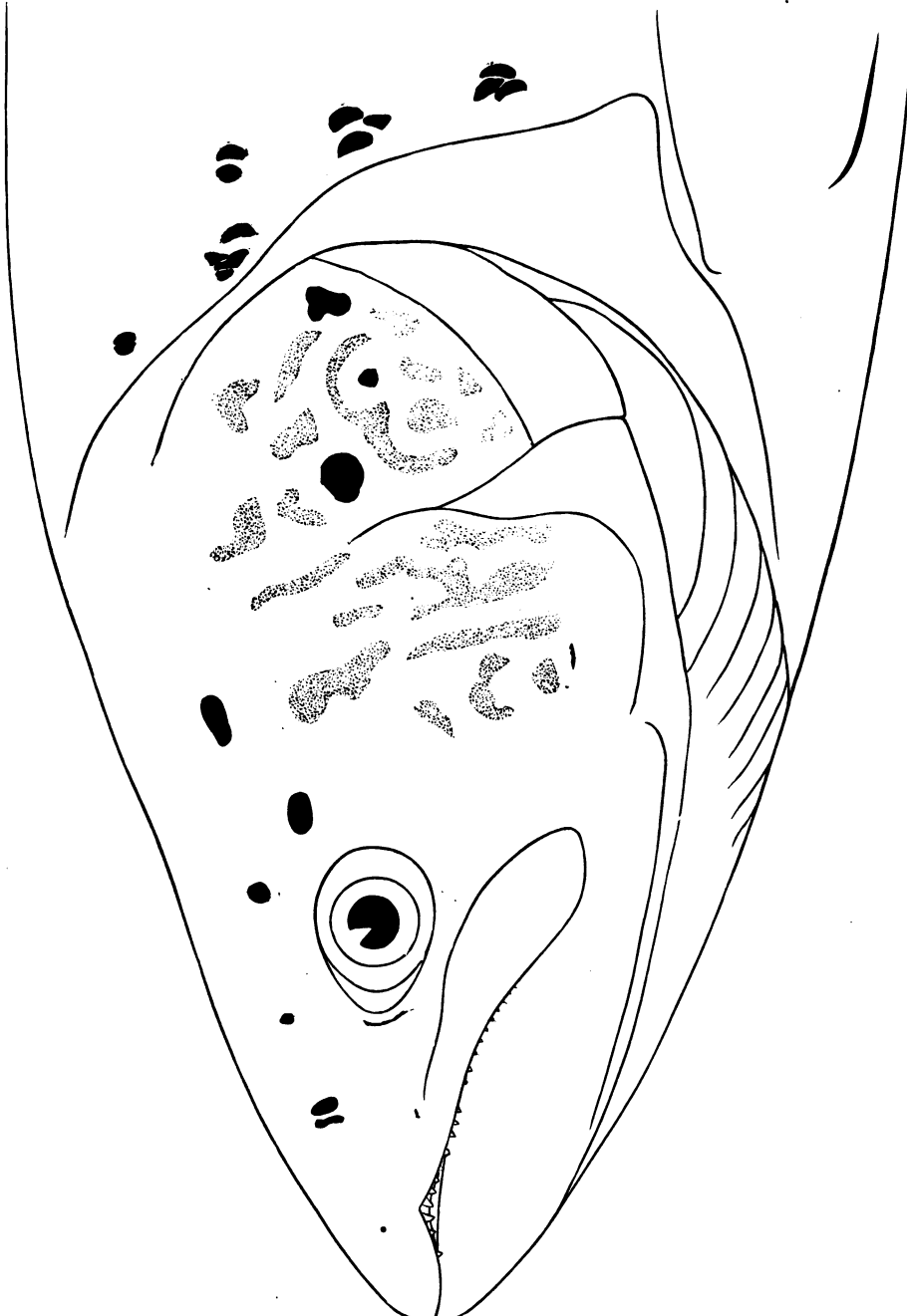




3. *Salmo gairdneri*. Female.

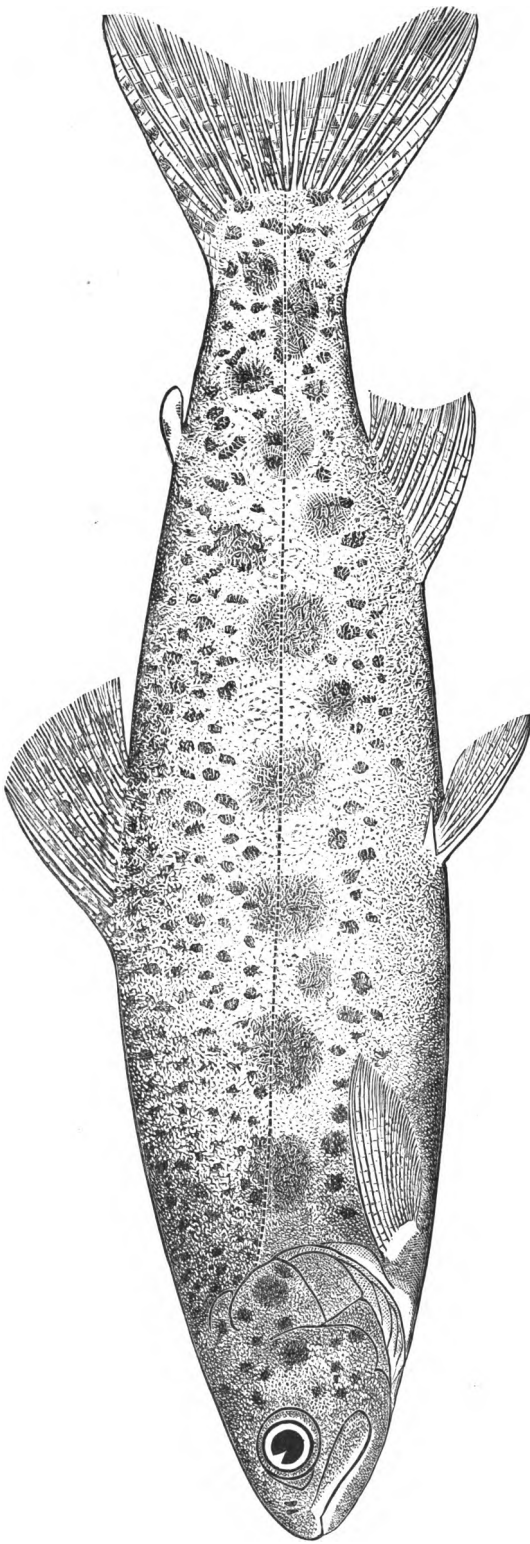






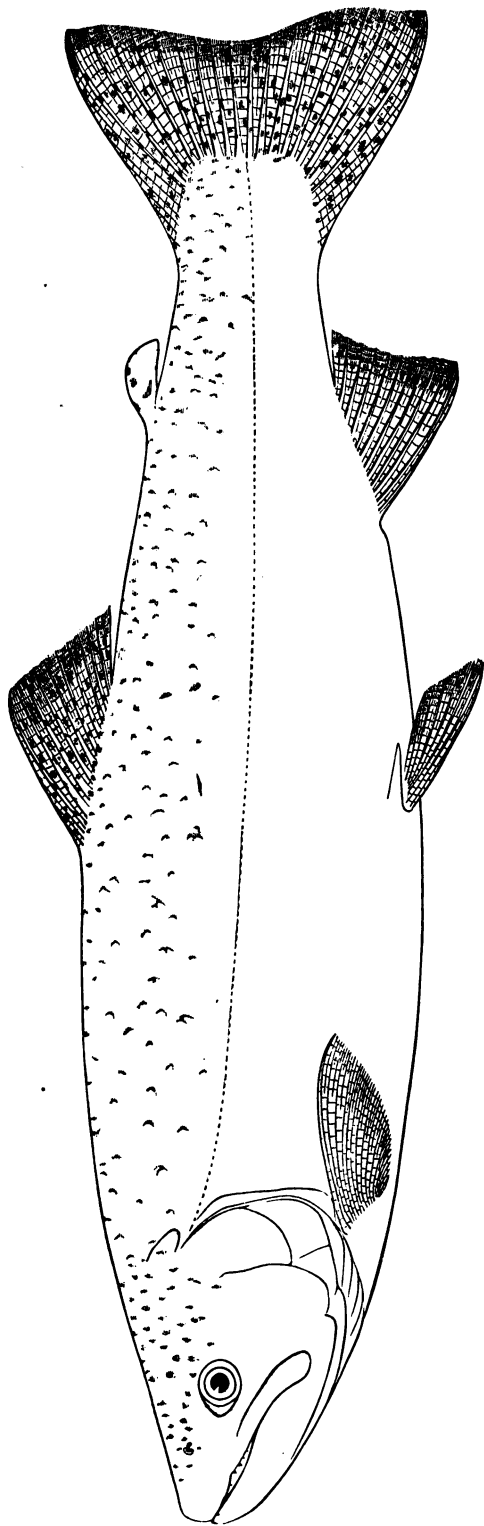
4. Saimo salar. Female.





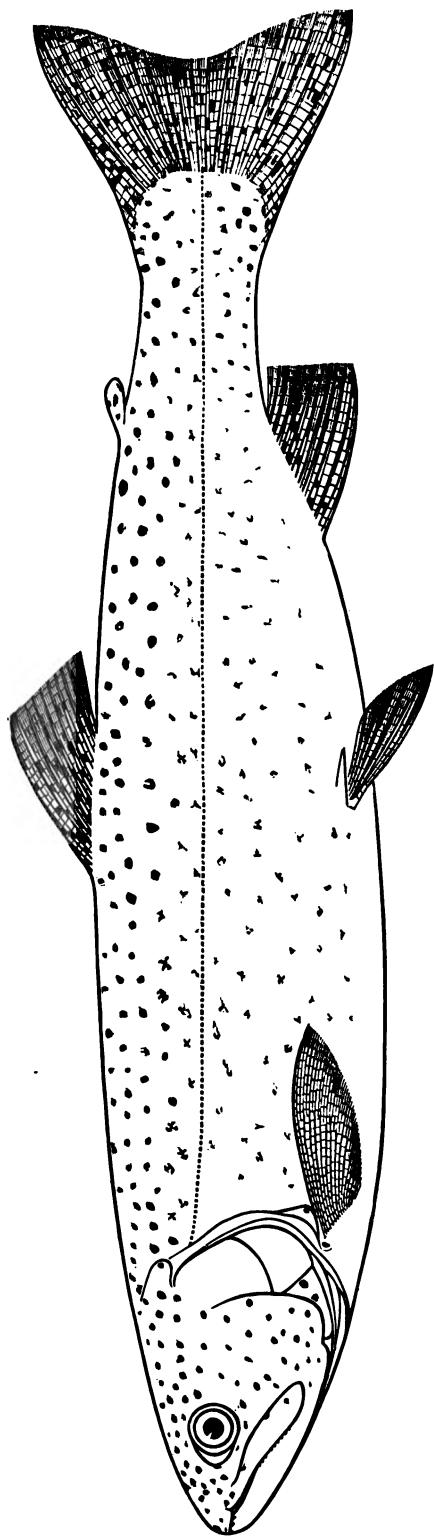
5. *Salmo irideus*. Male.





6. *Salmo gairdneri*. Male.

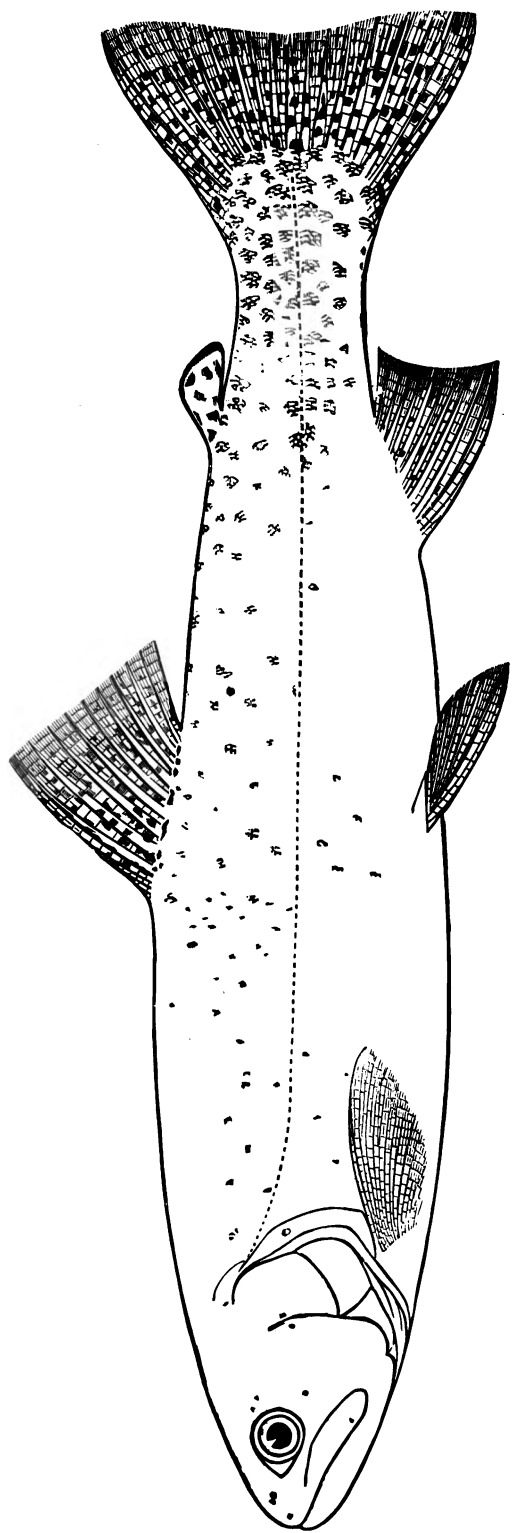




7. *Salmo clarki*. Female.

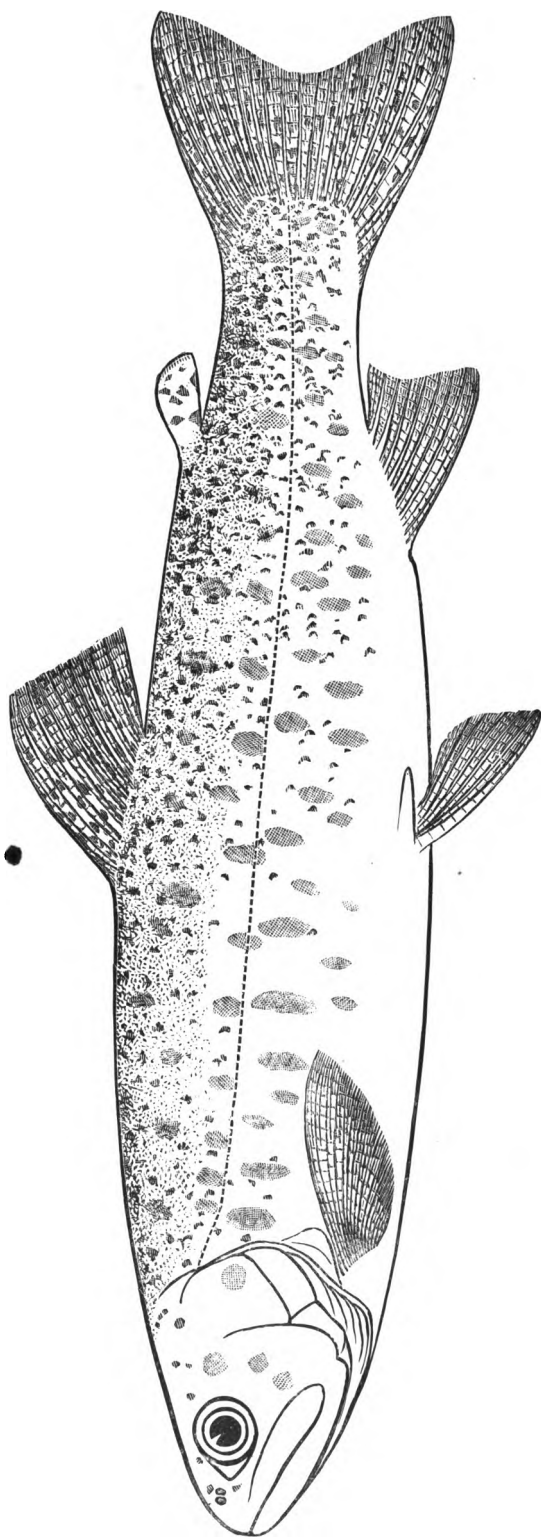






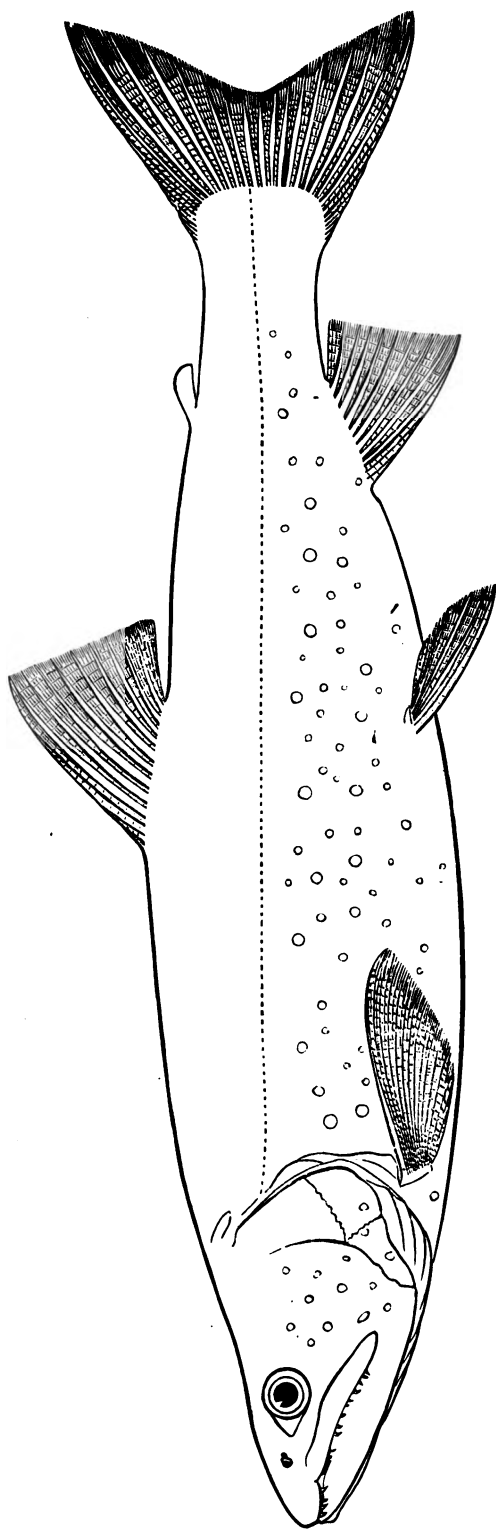
8. *Salmo virginalis*.





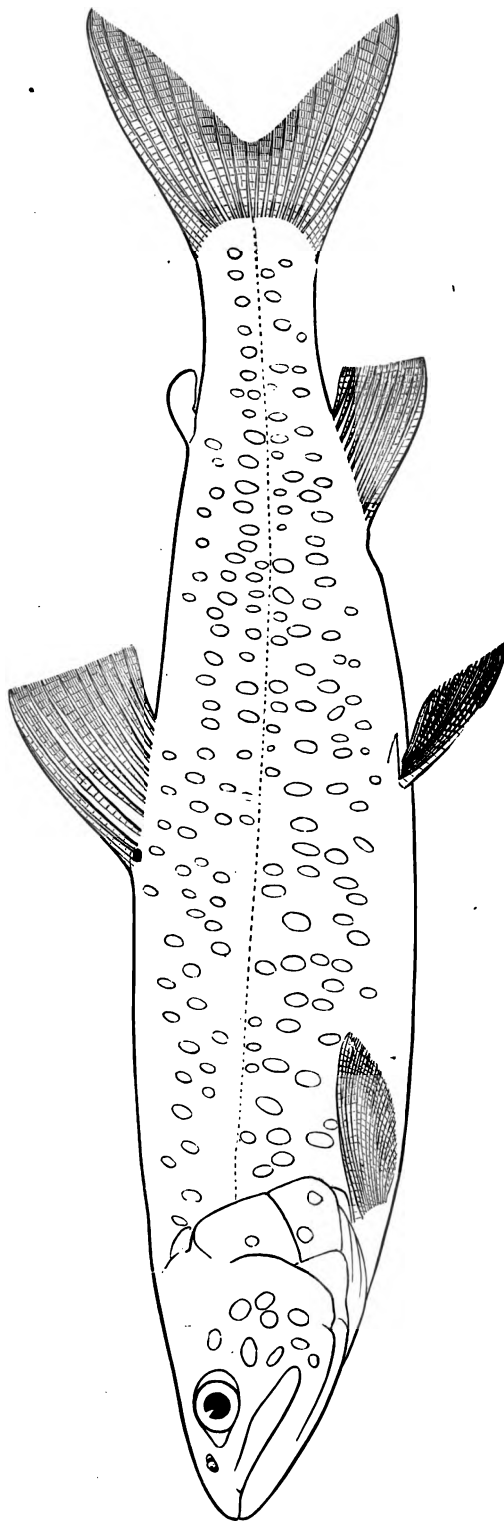
9. *Salmo lewisi*.





10. *Salmo namaycush*. Male.

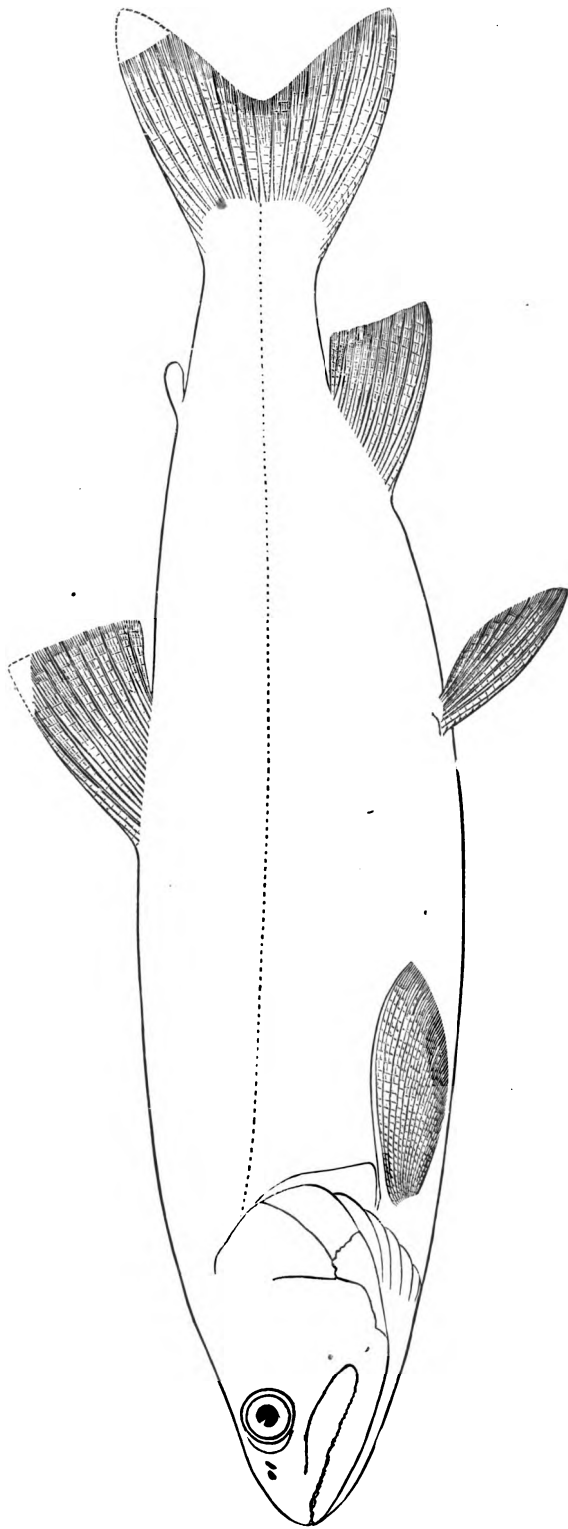




11. *Salmo namaycush*.

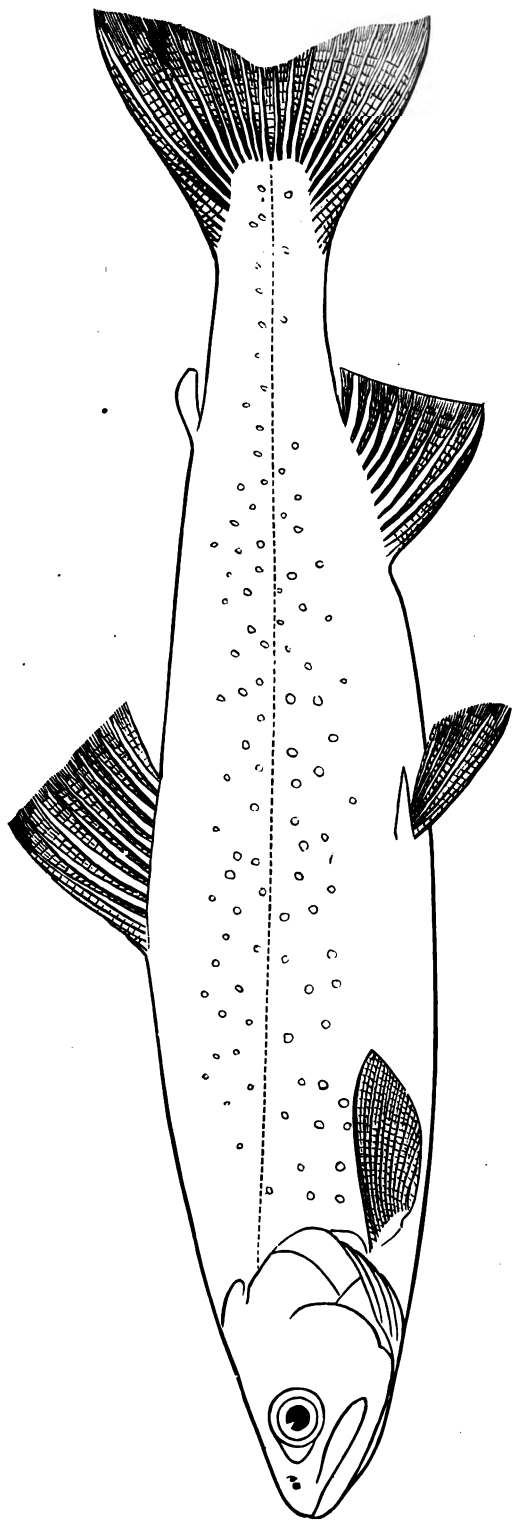






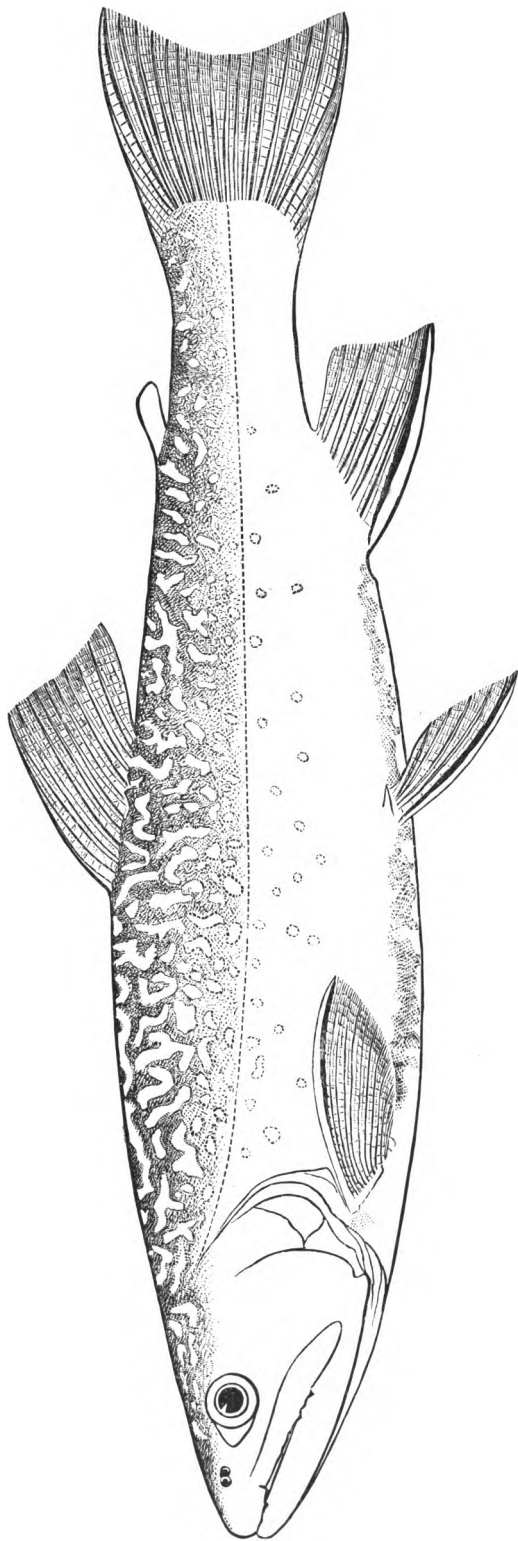
12. *Salmo siscowet*. Female.





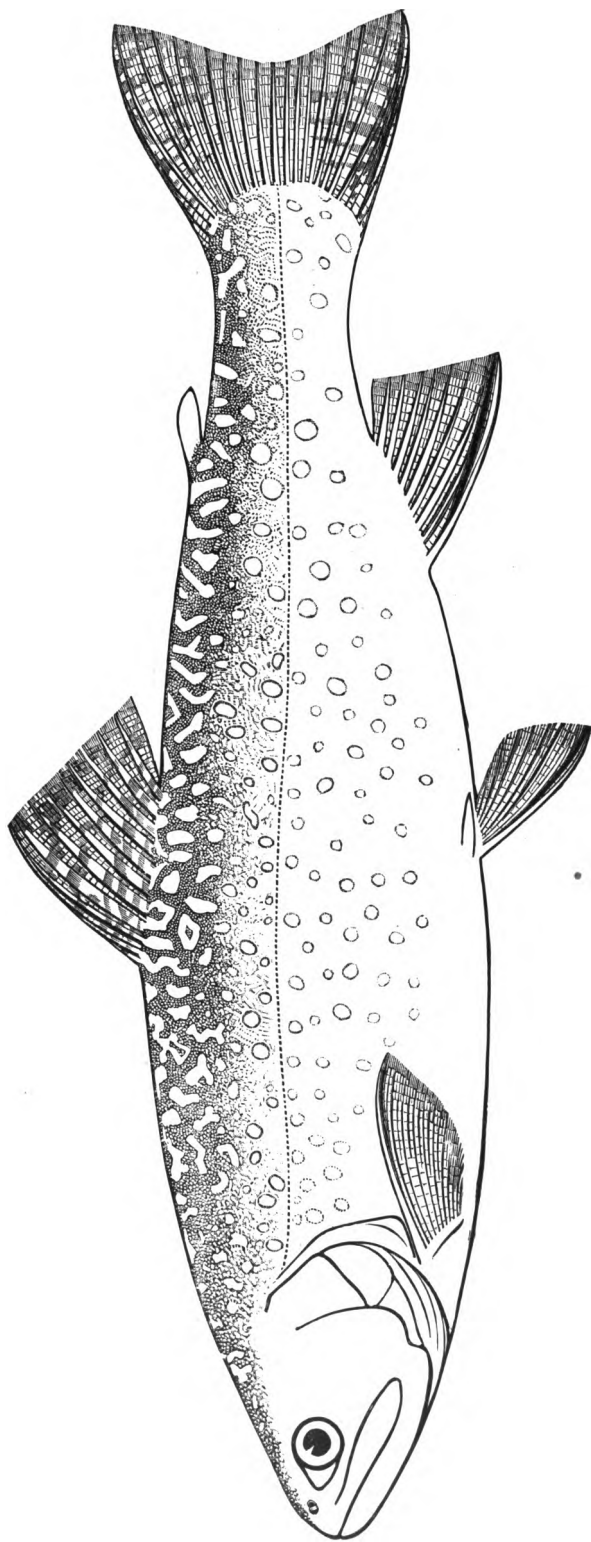
18. *Salmo oquassa*.





14. *Salmo fontinalis*. Male.

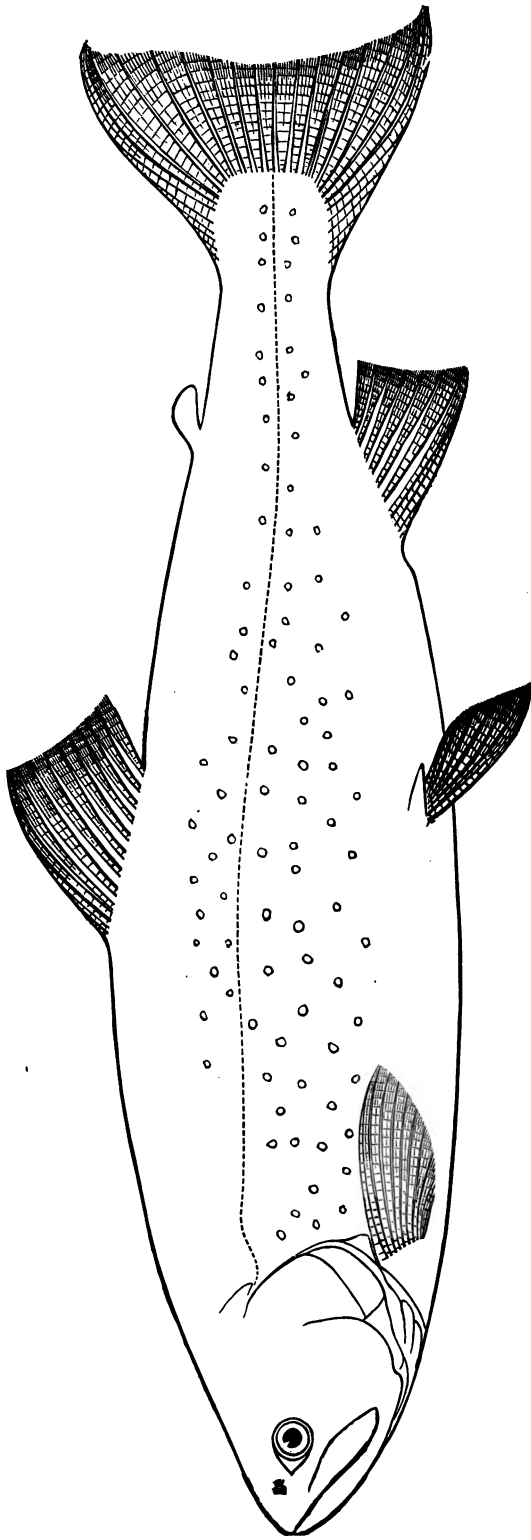




15. *Salmo fontinalis*. Female.

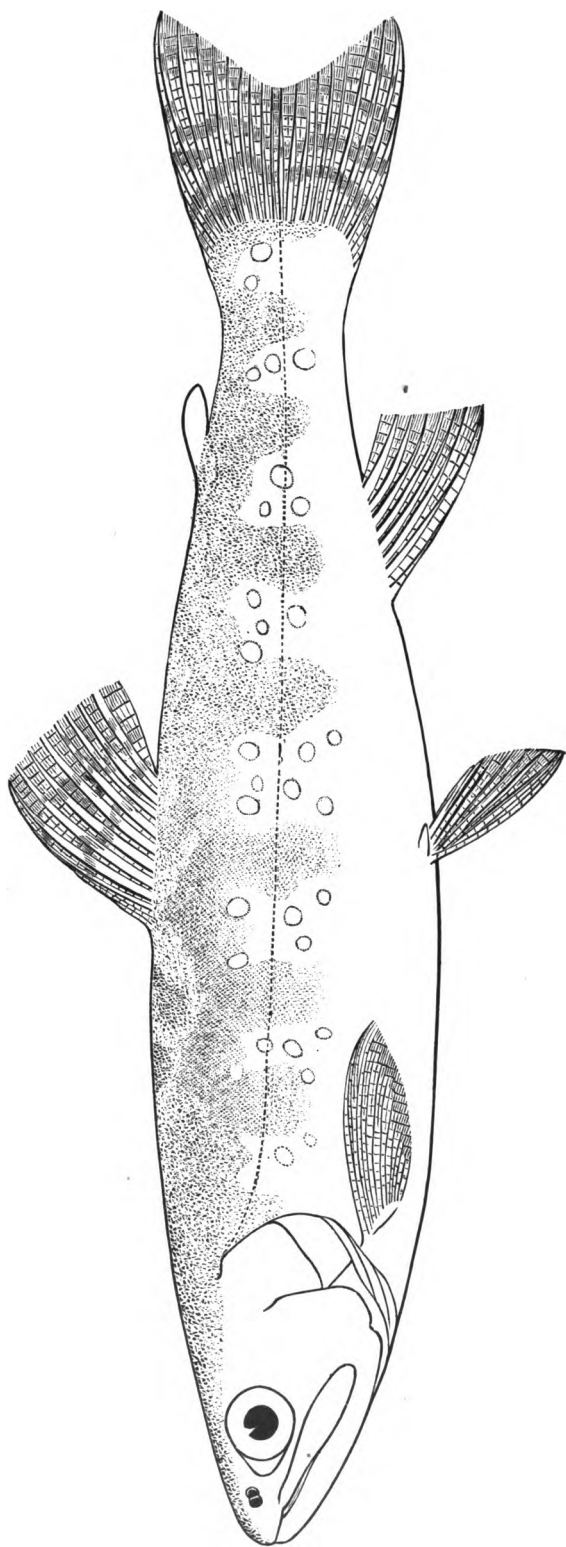






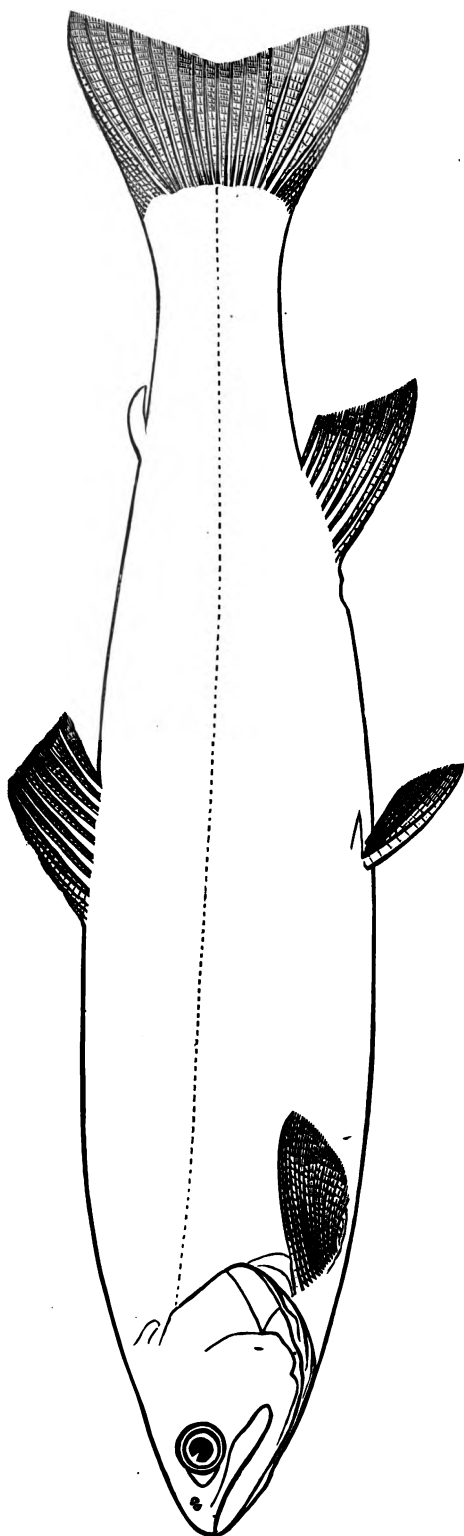
16. *Salmo fontinalis* var. Female.





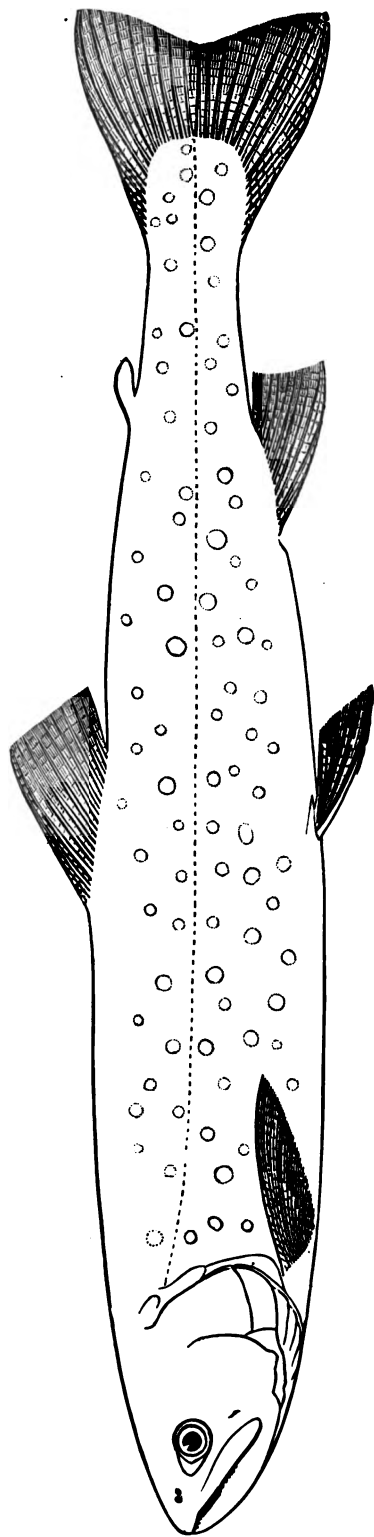
17. *Salmo agassizii*. Young.





18. *Salmo agassizii*. Female.





19. *Salmo stagnalis*. Male.





the head very thin; opercles membranaceous. Only a very faint indication of striæ on the opercles. Three rays of dorsal behind the middle of the total length. Caudal peduncle long, slender; notch shallow.

Back brownish; sides silvery; belly reddish; flanks thickly sprinkled with light spots, orange or red in life. Specimen drawn, sixteen and a half inches in length, from Godthaab, Greenland.

[F.]

## LAWS AND RESOLVES, 1884.

[CHAP. 171.]

AN ACT to limit the time within which Trout, Land-locked Salmon and Lake Trout may be taken.

*Be it enacted, etc., as follows:*

SECT. 1. The time within which any person is forbidden to take, sell, offer or expose for sale, or to have in his possession, a trout, land-locked salmon or lake trout, by sections fifty-one and fifty-three of chapter ninety-one of the Public Statutes, shall be between the first day of September and the first day of April.

SECT. 2. So much of said sections fifty-one and fifty-three as is inconsistent with this act is hereby repealed. [Approved April 19, 1884.]

[CHAP. 199.]

AN ACT in addition to an act to regulate the taking of Fish in North River in the county of Plymouth.

*Be it enacted, etc., as follows:*

SECT. 1. Whoever sets a seine or combination of seines over three hundred and eighty-five feet in length, or casts a mesh net over three hundred and fifty feet in length, in the North River in the county of Plymouth, shall for each offence be punished by fine not less than twenty-five nor more than one hundred dollars, or by imprisonment in the house of correction not less than one nor more than three months.

SECT. 2. Section forty-one of chapter ninety-one of the Public Statutes shall not apply to the fisheries in said North River.

SECT. 3. This act shall take effect upon its passage. [Approved April 30, 1884.]

[CHAP. 245.]

AN ACT concerning the Fisheries in waters of the county of Dukes County.

*Be it enacted, etc., as follows:*

SECT. 1. Section one of chapter one hundred and two of the acts of the year eighteen hundred and eighty-two is amended to read as follows: — Section 1. The lessees holding from the com-

missioners on inland fisheries a lease of any body of water in the county of Dukes County, and all other persons having the right to take alewives in any other waters in said county, may take alewives from said waters and from the ditches connecting them with each other and with the ocean at all seasons of the year and without restriction as to day.

SECT. 2. Section two of said chapter one hundred and two is amended to read as follows:—Section 2. Whoever other than said lessees or any other person duly authorized takes any fish, except eels, from any of said waters or ditches without the permission in writing of said lessees or said person duly authorized first obtained, shall forfeit one dollar for each fish so taken, and shall also forfeit any boat, net, line, rod or other apparatus used in such taking, in accordance with the provisions of chapter one hundred and ninety-four of the Public Statutes.

SECT. 3. This act shall take effect upon its passage. [*Approved May 20, 1884.*]

---

[CHAP. 317.]

AN ACT relative to Fishing in the Merrimack River.

*Be it enacted, etc., as follows:*

SECT. 1. Section one of chapter one hundred and sixty-six of the acts of the year eighteen hundred and eighty-two is hereby amended by inserting after the word “seine” and before the word “after” in the fourth line thereof, the following words: “with a mesh not less than two and a quarter inches.”

SECT. 2. This act shall take effect upon its passage. [*Approved June 3, 1884.*]

---

[CHAP. 264.]

AN ACT to protect the Fisheries of the towns of Mashpee and Barnstable.

*Be it enacted, etc., as follows:*

SECT. 1. No person not an inhabitant of the town of Mashpee shall fish for or take from the waters within said town, except Hamblin's Pond and its outlet, and excepting the trout fishery in Popponessett Bay, south of a line drawn from Gooseberry Island to Mashpee Neck, any fish, shell-fish or eels, without a written permit or lease from the selectmen of said town, stating the time, place, manner and number in which the same may be taken; nor shall any inhabitant of said town at any one time take more than three bushels of shell-fish for bait, or take any fish, shell-fish or eels for the purpose of selling the same, without a written permit from

said selectmen, who may grant the same for such sum, to be paid to the use of said town, as they shall deem proper : *provided, however*, that no seining shall be allowed in any of the waters of said town ; but the inhabitants of said town may take such fish, shell-fish and eels for family use without such permit, except from such fisheries as are lawfully leased by said town to others.

SECT. 2. Whoever fishes for, takes or destroys any fish, shell-fish or eels in the waters of said town of Mashpee in violation of the provisions of this act, or otherwise than is specified in his permit, and whoever wilfully places any obstruction to, or otherwise interferes with, the free passage of fish or eels in said waters, shall for each offence be subject to a fine of not less than fifty nor more than one hundred dollars and costs of prosecution, and if he have a permit shall forfeit the same ; and all fines under this act shall be paid, one-half to the town of Mashpee and one-half to the complainant. Said fine and forfeiture imposed under this act may be recovered by complaint before any trial justice, or by indictment before any court of competent jurisdiction in Barnstable County.

SECT. 3. Any constable or fishwarden of said town may, without a warrant, arrest any person whom he finds in the act of fishing for, taking or destroying fish, shell-fish or eels, in violation of this act, or in the act of carrying away fish, shell-fish or eels so taken, and detain him in some place of safe keeping until a warrant can be procured against such person upon a complaint for said offences, or either of them : *provided*, that such detention shall not exceed twenty-four hours.

SECT. 4. Section one of chapter thirty-five of the acts of the year eighteen hundred and fifty-two is hereby amended so as to read as follows : — No person shall set, draw or stretch any seine or drag-net in Barnstable Harbor, Osterville Harbor, Popponessett Bay, or any of the creeks, ponds or streams within the limits of the town of Barnstable, under a penalty of not less than fifty nor more than one hundred dollars, to be recovered in any court proper to try the same, one-half to the use of said town and the other half to any person who shall prosecute therefor.

SECT. 5. All acts and parts of acts inconsistent herewith are hereby repealed. [*Approved May 24, 1884.*]

---

[CHAP. 318.]

AN ACT to prevent the use of Nets in Ponds.

*Be it enacted, etc., as follows :*

SECT. 1. Whoever draws, sets, stretches or uses a drag net, set net, purse net or seine in any pond in the Commonwealth, or aids

in so doing, shall be punished by a fine of not less than twenty nor more than fifty dollars, one half of which shall be paid to the person making the complaint, and the other half to the county within which the offence was committed, and in addition shall forfeit to the Commonwealth all fish taken by the above means and the seines, boat and other apparatus used.

SECT. 2. Trial justices, police and district courts shall have jurisdiction to enforce the penalties provided in section one of this act.

SECT. 3. This act shall not be construed to interfere with the rights of lessees of great ponds in the counties of Barnstable, Dukes County and Nantucket, into which the usual varieties of salt water fish are or may be admitted by natural or artificial inlets, and which under existing leases have been seined or which may be leased with permission to seine the same, nor the riparian proprietors of ponds mentioned in section ten of chapter ninety-one of the Public Statutes, nor with the corporate rights of any fishing company. [*Approved June 3, 1884.*]

[G.]

## LIST OF PONDS LEASED

*By the Commissioners on Inland Fisheries, under Authority given  
by Chap. 384, Sect. 9, of the Acts of 1869.\**

---

## 1870.

- Feb. 1. Waushakum Pond, in Framingham, to Sturtevant and others, 20 years.  
April 1. Mendon Pond, in Mendon, to Leonard T. Wilson and another, 20 years.  
Sept. 12. Baptist Lake, in Newton, to J. F. C. Hyde and others, 20 years.  
Oct. 15. Archer's Pond, in Wrentham, to William E. George, 15 years.

## 1871.

- Jan. 10. Nine-Mile Pond, in Wilbraham, to B. F. Bowles, 10 years.  
30. Little Pond, in Falmouth, to F. H. Dimmick, 10 years.  
April -. Spectacle, Triangle, and Peters ponds, in Sandwich, to G. L. Fessenden and another, 5 years.  
17. Long Pond, in Falmouth, to Joshua S. Bowerman and three others, 20 years.  
May 15. Pratt's Pond, in Upton, to D. W. Batcheller, 20 years.,  
18. Little Sandy Pond, in Plymouth, to William E. Perkins 15 years.  
Nov. 1. Punkapoag Pond, in Randolph and Canton, to Henry L. Pierce, 20 years.

\* We would remind lessees of ponds that they are required, by their leases, to use all reasonable efforts to stock their ponds, and keep accurate records of the same, and make returns of their doings to the Commissioners on the 1st of October, each year, of the number and species of fish which they have put in or removed from their ponds. Any failure to comply with these conditions is a breach of contract invalidating their lease. It is important that the State should know just what is being done; and, where there appears to be mismanagement or apparent failure, the Commissioners will visit the ponds, and ascertain, if possible, the cause.

**1872.**

- Jan. 1. Sandy Pond, Forest Lake, or Flint's Pond, in Lincoln, to James L. Chapin and others, 20 years.
- July 20. Little Pond, in Braintree, to Eben Denton and others, 20 years.

**1873.**

- May 1. Meeting-house Pond, in Westminster, to inhabitants of Westminster, 15 years.
1. Great Pond, in Weymouth, to James L. Bates and others, 15 years.
- July 1. Little Sandy Pond, in Pembroke, to A. C. Brigham and others, 16 years.
- Sept. 1. Pontoosuc Lake, in Pittsfield and Lanesborough, to E. H. Kellogg and others, 15 years.
- Oct. 1. Farm Pond, in Sherborn, to inhabitants of Sherborn, 15 years.
1. Spot Pond, in Stoneham, to inhabitants of Stoneham, 15 years.
- Nov. 1. Lake Chaubunagungamong, or Big Pond, in Webster, to inhabitants of Webster, 5 years.
- Dec. 1. Lake Wauban, in Needham, to Hollis Hunnewell, 20 years.

**1874.**

- Mar. 1. Walden and White ponds, in Concord, to inhabitants of Concord, 15 years.
2. Upper Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 20 years.
- April 1. Elder's Pond, in Lakeville, to inhabitants of Lakeville, 15 years.
20. North and South Podunk ponds, in Brookfield, to inhabitants of Brookfield, 15 years.
- May 1. Maquan Pond, in Hanson, to the inhabitants of Hanson, 15 years.
2. Brown's Pond, in Peabody, to John L. Shorey, 15 years.
16. Wickaboag Pond, in West Brookfield, to Lemuel Fulham, 15 years.
20. Unchechewalom and Massapog ponds, to the inhabitants of Lunenburg, 20 years.
- July 1. Hardy's Pond, in Waltham, to H. E. Priest and others, 15 years.
1. Hockomocko Pond, in Westborough, to L. N. Fairbanks and others, 15 years.
11. Mitchell's Pond, in Boxford, to R. M. Cross and others, 15 years.

**1874.**

- July 11. Hazard's Pond, in Russell, to N. D. Parks and others,  
20 years.
- Oct. 1. East Waushacum Pond, in Sterling, to inhabitants of  
Sterling, 20 years.
20. Middleton Pond, in Middleton, to inhabitants of Mid-  
dleton, 15 years.

**1875.**

- Jan. 1. White and Goose ponds, in Chatham, to George W.  
Davis, 15 years.
- Mar. 1. Lake Pleasant, in Montague, to inhabitants of Monta-  
gue, 10 years.
1. Hood's Pond, in Ipswich and Topsfield, to inhabitants  
of Topsfield, 15 years.
- April 1. Chauncey Pond, in Westborough, to inhabitants of  
Westborough, 15 years.
3. West's Pond, in Bolton, to J. D. Hurlburt and others,  
15 years.
15. Gates Pond, in Berlin, to E. H. Hartshorn and others,  
15 years.
24. Pleasant Pond, in Wenham, to inhabitants of Wenham,  
15 years.
- May 1. Morse's Pond, in Needham, to Edmund M. Wood, 15  
years.
1. Chilmark Pond, in Chilmark, to J. Nickerson and  
others, agents, 20 years.
- July 1. Winter Pond and Wedge Pond, in Winchester, to in-  
habitants of Winchester, 15 years.
1. Haggett's Pond, in Andover, to inhabitants of An-  
dover, 20 years.
- Aug. 1. Oyster Pond, in Edgartown, to J. H. Smith and others,  
20 years.
7. West Waushacum Pond, in Sterling, to inhabitants of  
Sterling, 20 years.
9. Mystic (Upper) Pond, in Winchester, Medford, and  
Arlington, to inhabitants of Winchester and Med-  
ford, 15 years.
- Oct. 1. Little Chauncey and Solomon ponds, in Northborough,  
to inhabitants of Northborough, 15 years.

**1876.**

- Feb. 1. Great Sandy Bottom Pond, in Pembroke, to Israel  
Thrasher and others, 15 years.
- Mar. 1. Dennis Pond, in Yarmouth, to inhabitants of Yarmouth,  
15 years.



## 1876.

- Mar. 1. Crystal Lake, in Wakefield, to Lyman H. Tasker and others, 15 years.
20. Lower Naumkeag Pond, in Ashburnham, to inhabitants of Ashburnham, 18 years.
28. Dennison Lake, in Winchendon, to inhabitants of Winchendon, 15 years.
28. Phillipston Pond, in Phillipston, to inhabitants of Phillipston, 20 years.
- May 8. South-west Pond, in Athol, to Adin H. Smith and others, 15 years.
- June 1. Norwich Pond, in Huntington, to inhabitants of Huntington, 20 years.
10. Dug Pond, in Natick, to W. P. Bigelow and others, 15 years.
- Oct. 1. Farm and Learned's Pond, in Framingham, to inhabitants of Framingham, 15 years.
1. Whitney's Pond, in Wrentham, to inhabitants of Wrentham, 15 years.
1. Little Pond, in Barnstable, to George H. Davis, 15 years.

## 1877.

- Mar. 1. Nine-Mile Pond, in Wilbraham, to inhabitants of Wilbraham, 15 years.
15. Pentucket and Rock ponds, in Georgetown, to inhabitants of Georgetown, 15 years.
- Aug. 10. Onota Lake, in Pittsfield, to William H. Murray and others, 15 years.
- Oct. 1. Fort, Great Spectacle, and Little Spectacle ponds, in Lancaster, to inhabitants of Lancaster, 20 years.
1. Battacook Pond, in Groton, to George S. Graves and others, 15 years.
- Nov. 1. Tispaquin Pond, in Middleborough, to Abishai Miller, 15 years.

## 1878.

- Jan. 1. Sniptuit, Long, Snow, and Mary's ponds, in Rochester, to inhabitants of Rochester, 15 years.
- Mar. 16. Asnaconcomie Pond, in Hubbardston, to Amory Jewett, Jr., 15 years.
- April 1. Dorrity Pond, in Millbury, to inhabitants of Millbury, 10 years.
- May 1. Bear Hill Pond and Hall Pond, in Harvard, to inhabitants of Harvard, 15 years.
5. Spectacle, Peters, and Triangle ponds, in Sandwich, to George L. Fessenden, 10 years.

**1878.**

- Oct. 1. Eel Pond, in Melrose, to J. A. Barrett and others, 15 years.
1. Accord Pond, in Hingham, South Scituate, and Rockland, to inhabitants of those towns, 10 years.
1. Wright's and Ashley's ponds, in Holyoke, to Henry C. Ewing and others, 10 years.
1. Magog Pond, in Acton and Middleton, to inhabitants of Acton, 15 years.

**1879.**

- Feb. 1. Lake Mahkumac and Lake Overic, in Stockbridge, to inhabitants of Stockbridge, 10 years.
- July 1. Silver Lake, in Wilmington, to inhabitants of Wilmington, 10 years.
1. Fresh Pond, in Falmouth, to Thomas H. Lawrence, 20 years.
- Oct. 1. Pomp's Pond, in Andover, to inhabitants of Andover, 15 years.
- Nov. 1. Lake Quinapowitt, in Wakefield, to inhabitants of Wakefield, 14 years.

**1880.**

- Mar. 1. Lake Winthrop, in Holliston, to inhabitants of Holliston, 15 years.
15. Massapoag Pond, in Sharon, to inhabitants of Sharon, 10 years.
- May 1. Tisbury Great Pond, in Tisbury, to Allen Look and others, 10 years.
- June 1. Indian Pond, in Kingston, to inhabitants of Kingston, 10 years.
1. Jordan Pond, in Shrewsbury, to inhabitants of Shrewsbury, 15 years.
- July 1. Swan and Martin's ponds, in North Reading, to inhabitants of North Reading, 15 years.
- Sept. 1. Herring Pond, in Eastham, to William H. Nickerson, 10 years.
- Dec. 24. Chadwick's Pond, in Bradford and Boxford, to town of Bradford, 10 years.

**1881.**

- Jan. 1. Great and Job's Neck ponds, in Edgartown, to Amos Smith and others, 15 years.
- Mar. 1. The Mill Ponds (three), in Brewster, to Valentine B. Newcomb and another, 15 years.
- April 1. Long Pond, in Blandford, to Samuel A. Bartholomew and another, 15 years.
- May 2. Nonesuch Pond, in Weston and Natick, to W. A. Bulard and others, 15 years.

## 1882.

- Mar. 1. Blair's Pond, in Blandford, to Curtis M. Blair and another, 15 years.
- April 1. Ward Pond, *alias* Wightman Pond, in Ashburnham, to Herbert F. Rockwood and another, 15 years.
- May 1. Horn Pond, in Woburn, to inhabitants of Woburn, 15 years.
- June 1. Wickaboag Pond, in West Brookfield, to inhabitants of West Brookfield, 15 years.
- Oct. 1. Long and Hummock ponds, in Nantucket, to Charles E. Snow and others, 15 years.

## 1883.

- Mar. 1. Halfway Pond, in Plymouth, taken by Commissioners for 5 years, in accordance with provisions of Chap. 62, Acts of 1876.
- April 6. Fresh Pond, in Tisbury, to Allen Look and others, 15 years.
23. Keyes Pond, in Westford, to M. H. A. Evans, 15 years.
- May 7. Singletary Pond, in Sutton and Millbury, to towns of Sutton and Millbury, 15 years.
7. The Great Pond, in Ashfield, to town of Ashfield, 15 years.
- July 1. Lake Buell, in Monterey and New Marlborough, to town of New Marlborough, 10 years.

## 1884.

- June 1. Bald Pate, Four-Mile, and Stiles ponds, in Boxford, to inhabitants of Boxford, 10 years.
- July 15. Asneybunskeit Pond, in Paxton, to inhabitants of Paxton, 10 years.
15. Center Pond, in Dennis, to inhabitants of Becket, 10 years.
15. Buckmaster Pond, in Dedham, to Francis Soule and others, 10 years.
15. Fresh Pond, in Dennis, to inhabitants of Dennis, 10 years.
17. Farm Pond, in Cottage City, to John C. Hamblin and others, 15 years.
18. Mashpee, Great, and Wakeley ponds, in Mashpee, to inhabitants of Mashpee, 10 years.
- Aug. 30. Sand Pond, in Ayer, to inhabitants of Ayer, 15 years.
- Sept. 5. Great Pond, in North Andover, to inhabitants of North Andover, 15 years.



---

[H.]

**TABLES SHOWING**  
**RETURNS OF WEIRS, SEINES AND GILL-NETS.**

---

TABLE No. I. — POUNDS AND WEIRS. — Showing the Catch of each during 1884.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwies.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Pounders and Flat-fish.	Reels.	Other Fish.
Manchester.	John G. Heath.	93	2,880	124,720	-	72	35	-	84,026	-	-	5	57	-	1
"	Jones Bros.,	-	-	173,250	-	-	-	-	77,825	-	-	-	-	-	-
"	Jones & West,	-	90	107,136	-	-	-	-	23,851	-	-	-	-	-	67
Hingham,	Thomas Weston,	-	1,150	-	-	-	-	-	-	-	-	-	-	18,700	-
Sandwich,	T. L. Mayo and others,	-	-	30,800	-	-	-	-	110,860	-	4,820	103	-	-	11
Barnstable,	W. F. Carney and others,	118	1,263	415	294	-	58,611	64	2	-	120	5	8	-	-
Dennis.	Crowell Weir Co.,	-	-	6	-	-	-	12,050	25,215	-	94	62	-	-	-
"	Deep Water Weir Co.,	-	-	-	-	-	-	-	49,910	-	27	216	-	-	-
"	East Dennis Weir Co.,	6	1,000	-	-	-	-	-	14,095	-	17	-	-	-	2,972
"	Nobusset Fish Weir Co.,	6	1	-	-	1,027	-	-	4,189	-	777	20	1	-	-
"	Sears Bros.,	6	3,475	50	-	-	22	-	23,415	-	8	13	29	-	-
Brewster,	Freeman Atwood & Son,	6	125	-	-	5	-	-	22,070	-	1,176	460	56	-	-
"	Brewster Fish Weir Co.,	1	1,408	-	-	-	-	-	25,100	-	-	52	-	-	-
"	James Eldredge,	-	500	-	-	18	-	-	5,600	-	219	-	-	-	-
"	Ellis & Caboon,	-	-	-	-	-	-	-	1,470	-	440	12	-	-	-
"	J. H. Newcomb & Co.,	117	2,835	-	640	-	-	-	16,295	-	55	47	36	-	-
"	Parker & Ellis,	1	-	500	1	12	-	-	403	-	19	37	-	-	-



TABLE No. I.—POUNDS AND WEIRS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat Fish.	Rela.	Other Edible Fish.
Chatham,	Stephen F. Bearse,	467	59,350	-	-	-	-	-	72,808	-	-	-	-	-	-
"	Czar Weir Co.,	876	95,865	916,800	-	3	115	2	34,472	-	7	61	9,475	5	199
"	Andrew Harding,	719	59,002	169,025	-	-	-	-	48,875	-	-	2	2,461	4	504
"	Reed, Loveland & Co.,	265	62,127	74,650	22	-	227	2	55,219	1	3	-	23,403	-	-
"	Alpheus Mayo & Co.,	-	-	-	-	40	-	-	3,518	-	4,918	-	-	-	480
"	Middletown Weir Co.,	755	44,492	252,717	385	19	61	7	31,807	-	1	112	2,634	-	-
Harwich,	J. D. Allen,	25	5,646	-	-	3	1	-	1	-	-	1	1,652	14	2
"	J. N. Eldridge,	194	-	-	2	-	12,535	6	15,298	-	46	29	314	10	-
"	D. F. Weeks & S. E. Bearse,	334	14,408	-	101	11	6	8	85	-	8	23	2,340	-	1
Hyannisport,	T. F. Phinney,	76	2,286	9,610	187	-	100,041	19	-	-	5,646	-	211	-	7,875
Falmouth,	Prince M. Stuart,	9	255	75	-	10	83,600	1,086	2,970	-	456	63	2,794	-	-
"	Wood's Holl Weir Co.,	46	2,482	-	-	-	145,430	3,237	3,101	-	1,436	1,145	2,144	-	15,307
Matapoisett,	A. B. Bowman,	-	5,210	-	-	-	665	1,178	-	-	146	165	1,229	-	-
"	Jerome B. Dunn,	-	5,616	-	31,406	-	6,921	116	-	-	25	231	979	96	3
"	Joseph J. Nye,	-	5,298	2	-	-	10,866	350	-	-	29	1,255	2,216	69	-
Gosnold,	C. C. Allen,	-	2,885	-	-	-	56,197	440	163	-	876	447	5,404	-	-
"	Allen & Bosworth,	-	-	-	-	-	47,321	-	-	-	-	-	-	-	3,750



"	Charles C. Church,	.	.	5	-	-	1,181	-	118,513	1,061	14	-	35	-	717	1	6,169
"	Peter B. Davis,	.	.	-	-	-	-	-	45,500	303	-	-	-	-	-	-	5,150
"	L. A. Edwards,	.	.	3	1,265	26	1,074	102	39,801	1,415	4	-	125	506	3,976	3	2,193
"	Akin & Manley,	.	.	-	-	-	-	-	96,300	400	-	-	100	-	-	1,000	100
"	C. C. Murphy,	.	.	-	1,750	-	-	2	26,095	3,096	591	-	38	17	7,221	-	-
"	A. B. Veeder & Co.,	.	.	-	2,320	-	-	-	94,900	1,981	514	-	748	256	9,314	-	-
"	F. A. Veeder,	.	.	10	701	-	1,260	-	29,287	1,670	179	-	447	390	7,229	-	-
Fairhaven,	J. C. & J. J. Allen,	.	.	3	3,460	-	-	-	21,272	73	-	-	13	729	314	9	-
"	W. H. Bryant,	.	.	6	418	3,120	-	55	6,600	79	-	-	14	1,377	2,060	9	-
"	Daniel W. Deane No. 1,	.	.	6	16,981	-	4,119	123	33,534	371	-	-	3	1,710	1,672	132	23,830
"	Daniel W. Deane No. 2,	.	.	4	14,919	1,600	4,806	204	6,537	231	8	-	8	2,610	4,564	182	6,825
"	George R. Deane,	.	.	1	10,754	-	1,422	70	47,118	145	5	-	208	1,569	2,630	46	-
"	Samuel P. Dunn,	.	.	-	23,904	-	1,538	331	53,509	304	-	-	87	3,200	2,830	-	-
"	George L. Hiller,	.	.	5	15,120	-	-	52	49,751	673	1	-	37	1,841	4,169	-	-
"	Mathew Merry,	.	.	-	11,785	-	1,660	16	2,601	159	-	-	37	27	203	16	-
"	Ebenezer Mott,	.	.	5	9	-	2,533	28	2,992	130	-	-	29	882	768	14	-
"	C. H. Pease & Co.,	.	.	4	19,330	-	214	28	21,924	115	1	-	146	460	2,346	2	3
"	R. W. Pease,	.	.	6	6,271	10,100	1,020	218	13,645	207	-	-	102	-	1,320	-	-
"	D. C. Potter,	.	.	2	31,055	7	3,083	61	6,897	777	-	-	45	565	2,799	77	576
"	C. D. Sherman,	.	.	-	3,744	-	4,468	176	2,920	1,671	-	-	116	629	3,563	82	127
"	George R. Wixon,	.	.	5	21,182	-	3,389	37	5,246	211	-	-	185	188	637	133	-
"	George R. Wixon & Co.,	.	.	19	10,715	-	1,250	227	12,391	428	-	-	236	1,090	1,340	167	71

TABLE NO. I. — POUNDS AND WEIRS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alwives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Kels.	Other Edible Fish.
Dartmouth, . .	Joseph F. Biggs, . .	89	-	327	3,086	768	4,067	818	8	-	380	245	2,569	-	13
" . .	William E. Butts, . .	24	7,392	-	2,579	88	13,095	1,560	-	-	39	294	5,331	-	-
" . .	F. B. Manchester & Co., . .	198	40,772	60	21,700	1,323	7,482	1,841	-	-	263	-	2,417	-	-
" . .	George Prialux, . .	-	9,756	268	5,487	24	15,523	1,158	-	-	81	1,101	4,371	7	860
" . .	Benjamin Queripel, . .	141	10,821	2,687	32,667	83	26,334	1,010	-	-	23	2,709	3,790	-	-
" . .	George A. Snell, . .	298	48,585	-	-	204	94,945	7,250	-	2	267	-	12,141	-	95
" . .	Snell & Crapo, . .	44	11,547	10	2,005	189	576	2,181	5	-	682	528	4,793	-	67
" . .	Jonas Travers, . .	49	-	7,615	-	11	8,189	10,731	2	-	131	139	3,278	-	-
" . .	Waite & Smith, . .	128	19,784	-	168,320	1,096	30,841	9,149	9	-	1,840	369	17,129	2	-
South Dartmouth, . .	Nicholas Prialux, . .	46	5,174	6,655	-	18	4,335	587	-	-	157	284	4,654	76	-
Chilmark, . .	Richard Flanders & Co., . .	-	-	-	-	-	64,100	1,880	-	-	67	-	1,316	-	2,225
" . .	H. O. Poole & Co, . .	10	2,950	-	600	1	65,207	1,098	29	-	245	51	12,886	-	-
Tisbury, . .	C. F. Cleveland, . .	-	3,970	-	2,824	-	3,810	483	150	-	11	162	3,536	888	-
" . .	E. S. W. D. Cleveland, . .	2	540	3,647	36	-	1,129	778	-	-	1	-	6,087	-	-
" . .	Obed S. Daggett, . .	-	1,739	-	-	25	43,847	920	552	-	844	82	1,087	-	932
Total, . . . .		5,392	715,886	2,806,203	308,381	6,950	1,641,129	74,826	1,440,486	99	109,694	28,929	288,980	33,980	84,372

TABLE No. II.—SALT-WATER SEINES—Showing the Catch of each during 1884.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Bogue.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Rel.	Other Fish.
Newburyport, . .	Charles Caswell, . .	2,138	15,200	-	-	1	-	-	-	-	-	-	-	47	-
" . .	John Janvrin, . .	1,071	-	74,100	-	-	-	-	-	-	-	-	-	-	-
" . .	W. H. H. Perkins, . .	2,025	-	-	-	-	-	-	-	-	-	-	-	-	-
" . .	Ezra Thurlow, . .	1,167	-	416,400	-	-	-	-	3,000	-	4	-	-	640	-
Sandwich, . .	George F. Hozie, . .	-	-	-	-	65	-	-	-	-	-	-	-	-	-
Barnstable, . .	James A. Fish, . .	-	-	-	-	-	3,264	-	-	-	681	503	-	-	647
" . .	Henry C. Lambert, . .	-	-	-	-	-	72	-	-	-	4,959	-	-	7	-
Centerville, . .	Z. D. Bearse, . .	-	-	-	-	-	-	-	-	-	1,156	-	-	-	-
" . .	William E. Bearse, . .	-	-	-	-	114	310	-	-	-	2,176	-	-	-	-
Yarmouth, . .	D. S. Baker, . .	-	2,665	-	-	-	-	-	-	-	-	-	-	-	-
West Dennis, . .	Sylvester Baker, . .	-	1,697	-	-	-	-	-	-	-	-	-	-	-	-
Truro, . .	Dolby & Loring, . .	-	-	-	-	-	-	-	-	-	89	-	-	-	-
Orleans, . .	John M. Smith, . .	-	-	-	-	-	-	-	-	-	6,712	-	-	-	-
Chatham, . .	Horatio Howes, . .	-	-	721	-	-	-	-	-	-	-	-	-	-	-
Hyannisport, . .	B. F. Lambert, . .	-	-	-	-	-	-	-	-	-	3,517	-	-	-	-
Westport, . .	Samuel G. Allen, . .	-	13,055	15	16	53	-	1	-	-	-	1	2	36	843

TABLE II. — SALT-WATER SEINES — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Spanish Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Rela.	Other Edible Fish.
Westport, . . .	Theodore Pierce,	-	5,016	-	-	52	-	3	-	-	-	-	31	405	-
" . . .	Perry G. Potter,	-	10,978	-	1,823	26	-	-	-	-	-	-	-	-	-
South Westport, .	Leonard M. Sanford,	2	3,515	-	-	29	-	-	-	-	-	-	-	575	-
" . . .	Charles A. Tripp,	20	3,447	-	4	8	-	-	-	-	-	115	-	384	-
South Dartmouth, .	John Meadreas,	107	-	11,373	-	227	2,016	1,323	2	6	61	280	2,693	-	-
Nantucket, . . .	Charles E. Snow,	-	3,334	-	-	-	-	4	-	-	699	-	-	-	16,308
	Total, . . .	6,530	53,907	502,609	1,843	575	5,682	1,336	8,002	6	20,044	899	2,716	2,074	17,798

TABLE No. III.—GILL-NETS.—Showing the Catch of each during 1884.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Bogue.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fab.	Eels.	Edible Fish.
Barnstable,	S. H. Crawford,	.	.	.	.	.	84	.	.	366	.	.	.	.
"	H. F. Kelley,	.	.	.	.	.	.	.	.	2,010	.	.	.	.
"	J. D. Kelley,	.	.	.	.	.	.	.	.	1,187	.	.	.	.
Centreville,	W. H. Hallett,	.	.	.	.	.	.	.	.	1,601	.	.	.	.
"	B. W. Lewis,	.	.	.	.	.	.	.	.	503	473	.	.	.
Cotuit,	David Rogers,	.	.	.	.	.	.	.	.	4,063	.	.	.	.
Dennis,	Zenas H. Baker,	.	.	1	3	5	1	.	.	1,192	.	21	57	49
"	Venez Kelley,	.	6,330	.	.	.	.	.	.	252	.	.	.	.
"	Joahua Pierce,	.	.	.	.	.	.	.	.	1,543	.	.	.	.
Wellfleet,	W. F. Pierce,	.	.	30,000	.	.	.	.	55,608	10,238	.	.	.	.
Truro,	Benjamin Coan,	.	.	.	.	.	.	.	2,020	486	.	.	.	.
"	E. P. Worthen,	.	.	.	.	.	.	.	1,433	-	.	.	.	.
North Truro,	R. S. Chandler,	.	.	.	.	.	.	.	500	125	.	.	.	.
"	Caleb M. Grozier,	.	.	.	.	.	.	.	1,214	372	.	.	.	.
Provincetown,	James F. Atkins,	.	.	.	.	.	.	.	7,764	629	.	5,000	.	.
"	Paul L. Bangs,	.	.	.	1	.	.	.	1,280	913	.	.	.	.
"	Nathaniel N. Cook,	.	.	.	.	.	.	.	.	2,052	.	.	.	.

TABLE No. III. — GILL-NETS — Continued.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Squeteague.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Reba.	Other Edible Fish.
Provincetown,	Manuel Frances,	.	.	.	.	.	.	.	6,771	1,422	.	.	.	.
"	John Freeman,	.	.	.	.	.	.	.	-	155	.	.	.	.
"	George W. Freeman,	.	.	.	.	.	.	.	193	332	.	.	.	.
"	S. H. Ghen & R. Atkins,	.	.	.	.	.	.	.	-	2,066	.	.	.	.
"	J. C. P. Harvender,	.	1,518	7,392	.	.	.	.	35,330	.	.	.	.	.
"	Levi B. Kelley,	.	.	.	.	.	.	.	2,878	711	.	.	.	.
"	George Lewis,	.	.	.	.	.	.	.	9,813	2,498	.	3,570	.	.
"	Jonathan H. Little,	.	.	.	.	.	.	.	-	208	.	.	.	.
"	Joseph Mayo,	.	.	.	.	.	.	.	21,126	3,914	.	.	.	.
"	Thomas Mayo,	.	.	688	.	.	.	.	558	.	.	.	.	.
"	James G. Rand,	.	.	.	.	.	.	1,075	16,779	8,742	.	.	.	.
"	Reuben Ryder,	.	.	.	.	.	.	.	2,013	1,601	.	7,700	.	.
"	Edwin Sears,	.	.	400	.	.	.	.	7,744	.	.	.	.	.
"	Joseph Sears,	.	275	230	.	.	1	.	9,451	2,344	.	.	.	.
"	Lot Small,	.	.	.	.	.	.	.	193	102	.	.	.	.
"	H. N. Smith,	.	.	.	.	.	.	138	2,552	.	.	.	.	.
"	Reuben Swift,	.	.	.	.	.	.	.	1,885	1,481	.	.	.	.



TABLE NO. III. — GILL-NETS — Concluded.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Sea Herring.	Menhaden.	Striped Bass.	Scup.	Bquckeguc.	Mackerel.	Bluefish.	Tautog.	Flounders and Flat-fish.	Reis.	Other Rable Fish.
Nantucket.	A. H. Adams,	.	.	.	.	.	.	.	.	2,251	.	.	.	.
"	Horace B. Cash,	.	.	.	.	.	25	.	.	2,106	.	1	.	.
"	Isaac P. Dunham,	.	.	.	.	.	.	.	.	4,535	.	.	.	.
"	W. I. Fisher,	.	.	.	.	.	.	.	.	2,681	.	.	.	.
"	J. O. Freeman,	.	.	.	.	.	.	.	.	2,016	28	.	.	.
"	R. W. Paine & Co.,	.	.	.	.	.	10	5	.	1,407	.	.	.	.
"	Warren F. Ramadell,	.	.	.	.	.	.	56	.	3,192	92	.	.	.
Total,	.	14	8,405	39,080	183	57	2,193	1,018	213,827	116,024	679	16,325	352	231



TABLE NO. IV. — CONNECTICUT RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
South Hadley, . . . .	C. C. Smith and others, . . . . .	1,539
Agawam, . . . . .	A. Converse, . . . . .	54
	Total, . . . . .	1,593

TABLE NO. V. — MERRIMAC RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.
North Andover, . . . .	Eben Sutton, . . . . .	14
West Newbury, . . . .	Jonathan Morrill, . . . . .	97
	Total, . . . . .	111

TABLE NO. VI. — TAUNTON RIVER SEINES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.
Raynham, . . . . .	J. S. Townsend & Bros., . . . .	302	114,100	-
" . . . . .	G. B. & E. Williams, . . . .	574	127,369	-
Taunton, . . . . .	John W. Hart & Co., . . . .	237	59,800	-
Dighton, . . . . .	O. M. & E. Buffington, . . . .	400	75,000	-
" . . . . .	Edmund Hathaway, . . . .	695	121,076	429
" . . . . .	Charles N. Simmons, . . . .	600	140,000	-
Berkley, . . . . .	Isaac N. Babbitt, . . . .	229	66,815	-
" . . . . .	Nichols & Shove, . . . .	600	164,000	-
" . . . . .	W. H. Walker, . . . .	400	72,000	-
Somerset, . . . . .	George H. Simmons, . . . .	-	20,076	-
	Total, . . . . .	4,087	959,736	429

TABLE NO. VII.—OTHER FRESH-WATER SEINES AND DIP-NET FISHERIES.

TOWN OR PLACE.	PROPRIETOR.	Shad.	Alewives.	Striped Bass.	Frostfish.
Medford, . . .	Cross Bros., . . .	-	163,810	-	-
Weymouth, . . .	Weymouth Iron Co., . . .	-	68,750	-	-
Plymouth, . . .	W. S. Hadaway, . . .	-	-	-	15,000
" . . .	B. F. Hodges,* . . .	7	18,287	-	-
" . . .	Town Brook, . . .	-	44,020	-	-
Yarmouth, . . .	Long Pond Fishing Co., . . .	-	9,630	-	-
Brewster, . . .	Winslow & Newcomb, . . .	-	130,388	-	-
Wellfleet, . . .	Herring Brook, . . .	-	130,415	-	-
Mashpee, . . .	M. Amos, . . .	-	2,866	-	-
" . . .	David Lovell, . . .	13	8,148	733	-
" . . .	W. R. Mingo, . . .	-	25,465	-	-
Westport, . . .	Lysander W. White, . . .	-	4,155	6	-
South Westport, . . .	Philip S. Tripp, . . .	2	4,913	58	-
	Total, . . .	22	610,847	897	15,000

\* One salmon.

TABLE No. VIII. — *Comparison of Returns for the Years 1882, 1883 and 1884.*

YEAR.	FISHERIES.		Shad.	Bea Herring.	Alewives.	Menhaden.	Mackerel.	Spanish Mackerel.	Bluebsh.	Striped Bass.	Scup.	Squeeteague.	Tautog.	Flounders and Flat-fish.	Bels.
	Kind.	Num-ber.													
1882.	Pounds and weirs.	85	27,769	1,201,449	1,420,919	8,102	3,299,512	310	133,805	4,219	1,991,480	67,266	40,512	114,843	4,016
1883.	"	87	5,994	339,116	1,250,263	4,048,022	4,756,490	246	60,182	2,876	1,848,583	92,671	35,481	184,387	5,361
1884.	"	93	5,392	2,806,203	715,686	308,381	1,440,486	99	109,694	6,950	1,641,129	74,826	28,929	268,930	33,980
1882.	Sea seines.	33	1,222	20,005	186,321	10	23,717	6	64,963	1,280	53,975	839	2,321	1,784	2,936
1883.	"	24	19	610	40,515	934,523	10,567	4	22,916	627	4,321	23	804	816	487
1884.	"	22	6,530	502,609	58,907	1,343	3,002	6	20,044	576	5,662	1,336	899	2,716	2,074
1882.	Gill-nets.	100	516	290,606	238,309	623	568,370	81	136,705	147	45,071	3,366	3,924	31,703	97
1883.	"	88	7	79,179	1,431	3,104	381,968	-	108,899	311	1,933	1,079	162	11,865	1,268
1884.	"	63	14	39,080	8,405	183	213,827	-	116,024	57	2,193	1,918	679	16,325	352
1882.	Conn. River seines.	3	2,770	-	-	-	-	-	-	-	-	-	-	-	-
1883.	"	4	3,591	-	-	-	-	-	-	-	-	-	-	-	-
1884.	"	2	1,593	-	-	-	-	-	-	-	-	-	-	-	-
1882.	Merrimac River seines.	4	387	-	2,800	-	-	-	-	-	-	-	-	-	-
1883.	"	2	146	-	-	-	-	-	-	-	-	-	-	-	-
1884.	"	2	111	-	-	-	-	-	-	-	-	-	-	-	-
1882.	Taunton River seines.	11	11,173	-	1,039,272	-	-	-	-	-	-	-	-	-	-
1883.	"	11	6,012	-	1,123,473	-	-	-	-	-	-	-	-	-	-
1884.	"	10	4,037	-	959,736	-	-	-	-	-	-	-	-	-	-
1882.	Other fresh-water seines.	25	897	-	1,558,659	-	-	-	-	-	-	-	-	-	-
1883.	"	23	391	-	1,762,950	-	-	-	-	-	-	-	-	-	-
1884.	"	13	22	-	610,847	-	-	-	-	-	-	-	-	-	-
1882.	Total.	261	44,734	1,512,060	4,446,280	8,735	3,876,699	397	335,473	5,929	2,090,526	71,471	46,757	148,880	7,049
1883.	"	239	16,760	4,118,805	4,178,682	4,985,649	5,146,025	250	191,997	5,080	1,854,837	98,773	36,807	197,098	7,116
1884.	"	205	17,999	3,847,892	2,333,781	309,907	1,567,315	105	245,762	7,582	1,648,984	79,080	30,507	307,971	36,406
	Increase of 1884 over 1883.	-	2,639	2,929,087	-	-	-	-	63,765	2,502	205,863	-	-	110,903	26,290
	Decrease " " below "	34	-	-	1,824,901	4,675,742	3,491,710	145	-	-	-	15,693	6,300	-	-









3 2044 072 181 043

